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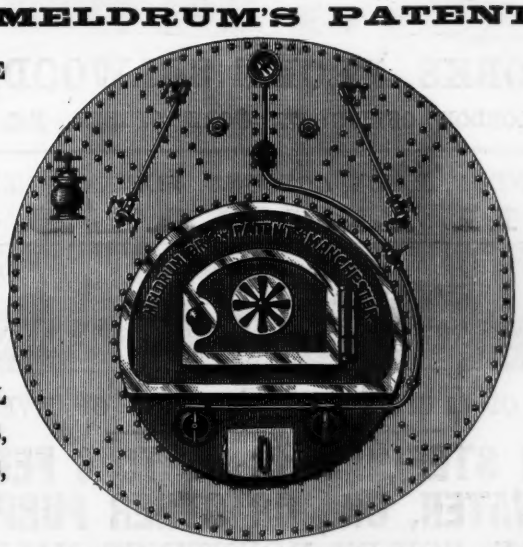

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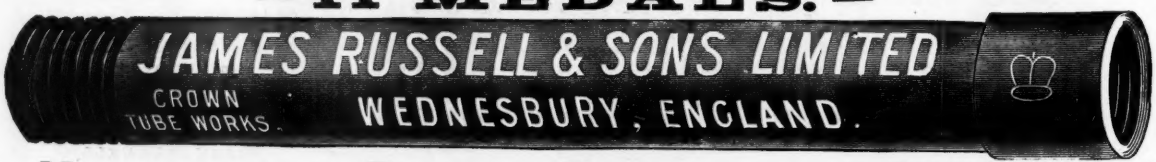

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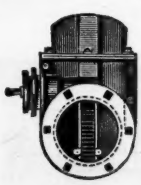

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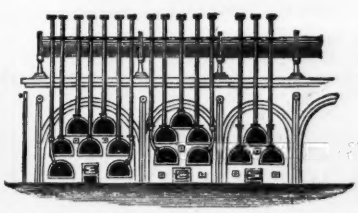

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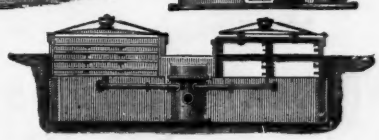

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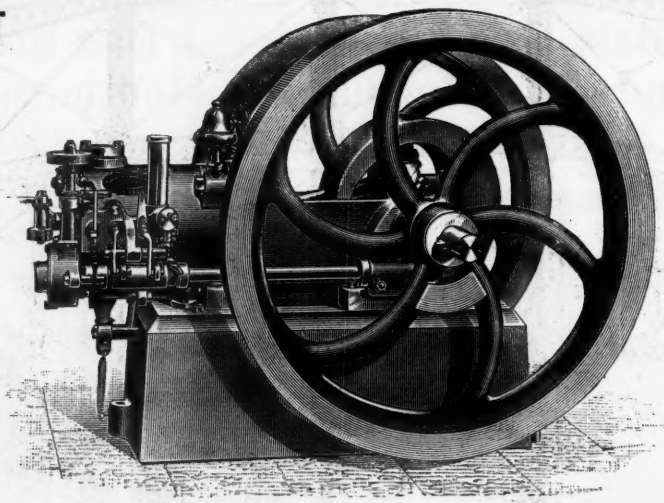

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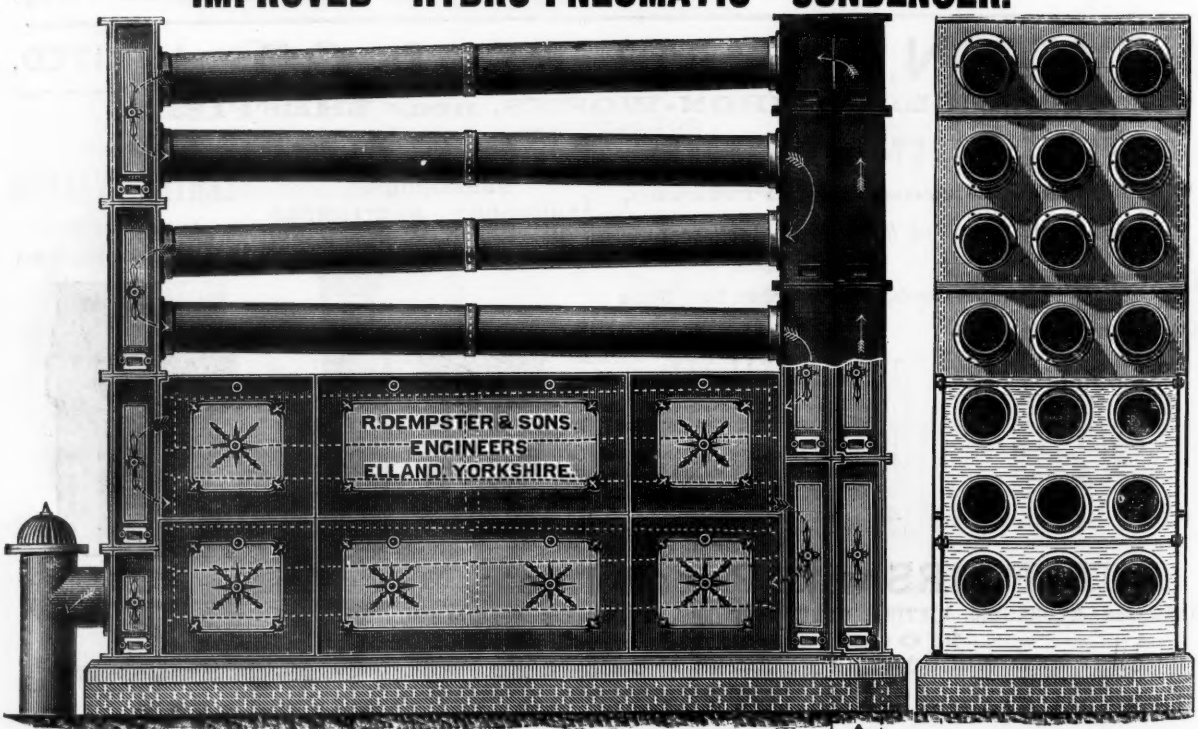

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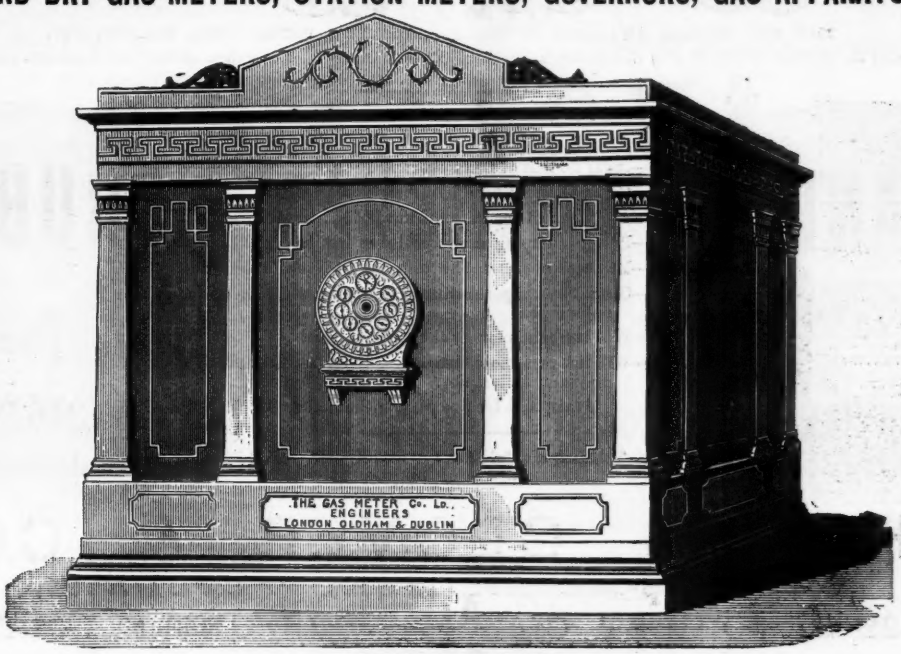

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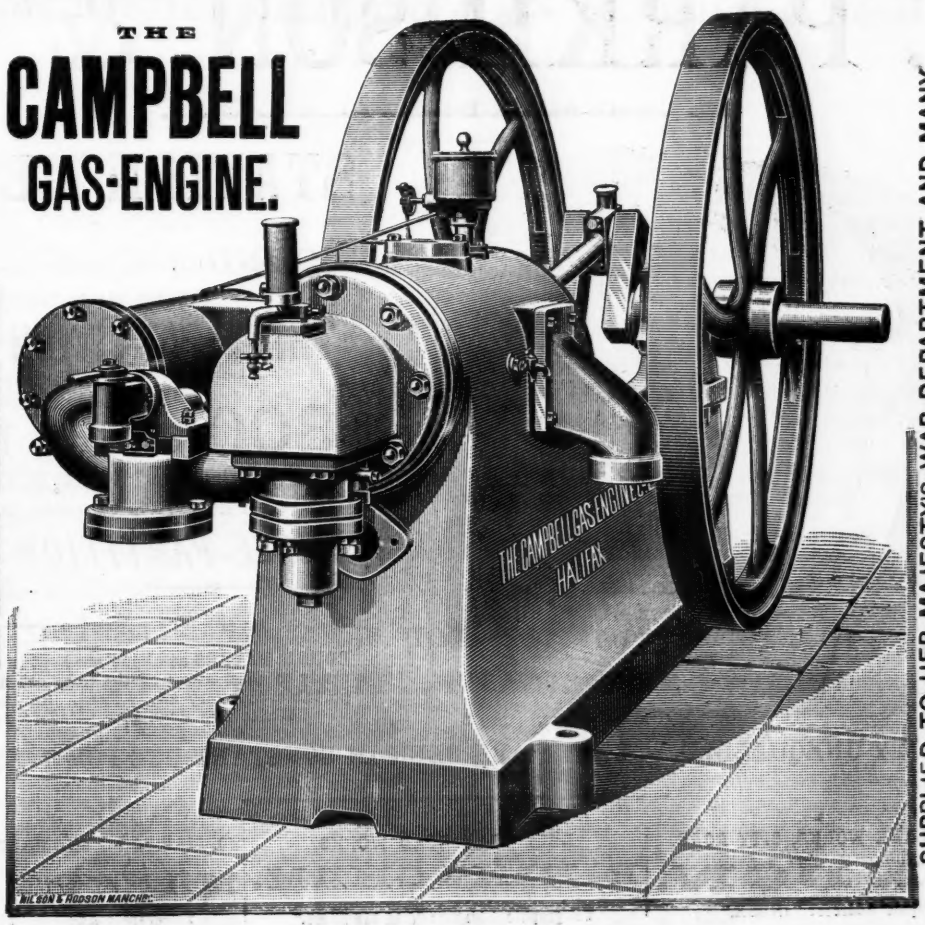

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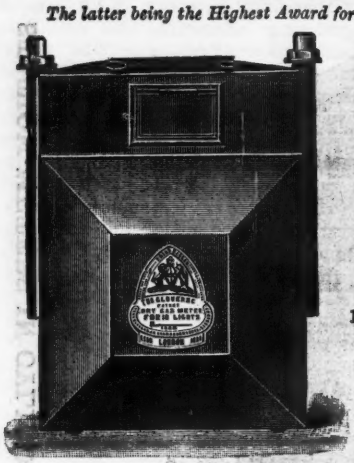

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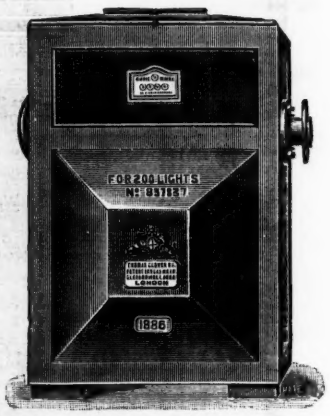

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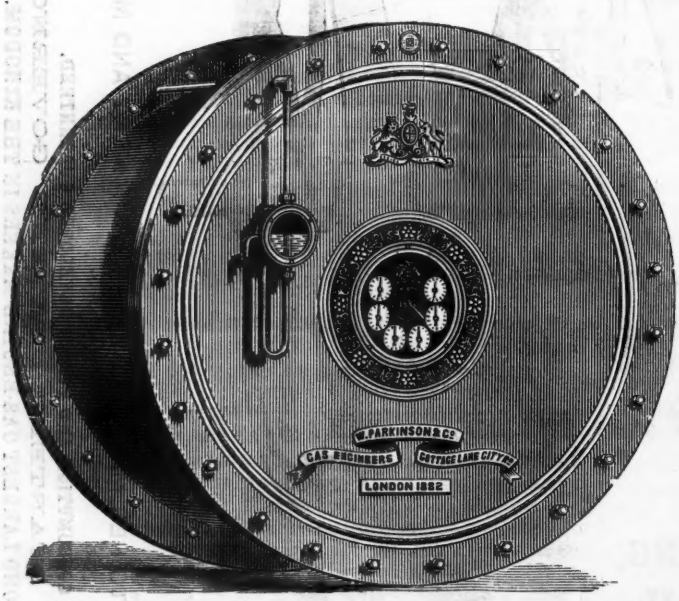

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TUESDAY, JANUARY 3, 1893.

A Free Labour Exchange.

ON Wednesday last a statement which may turn out to be of considerable importance in connection with the organization of the free and disposable labour of the country, was promulgated "under all possible reserve," as the French say, through the medium of the *Globe*, a London evening newspaper which has been honourably distinguished for having kept from truckling to the demagogues, charlatans, and sciolists who, in the name of the New Unionism, have given such a fantastic turn to "popular" industrial politics. The statement was to the effect that arrangements are now in progress for the creation of a "British "Labour Exchange," with head-quarters in London and agencies covering the whole country, which is to provide the machinery for registering labourers, and collecting and disseminating reliable information respecting places where work is or is not to be had. The idea of the proposed organization is something very like that which has already borne such good fruit in the operations of the Shipping Federation; but the new scheme is to be established on a much wider basis than that afforded by the carrying trade. All workmen, whether belonging to a Trade Union or not, are to be eligible for enrolment at the offices of the Exchange; and the possession of an Exchange ticket will entitle the holder to receive the benefits of the organization in any part of the kingdom. Registered labourers will be assisted to move from place to place, if necessary; and they will "have the pick of the work" wherever trade happens to be brisk. Eventually, if the project succeeds, a benefit scheme on a gigantic scale may be added to the original programme of the Exchange, which is reported to have already received promises of support from employers representing £200,000,000 of capital in industrial employment; and this substantial patronage is expected to be largely increased within the next few months.

If any inducement were needed to the serious consideration of this project, it is supplied by the "yell of deprecation" that has greeted it from the partisans of the New Unionism, who see in it the Nemesis long invited by the vagaries of the Wilsons, Tilletts, Manns, and their kind. The *Daily Chronicle* of Thursday took note of the "suspicious scheme" in an article in which bluster was mingled with misrepresentation and entreaty—the correct New Union mixture, of right "mass-meeting" brand—and made the remarkable discovery that the whole project amounts to a "deadly insult" to the British workman. It is declared that the notion of such an organization is "an attempt to excite a social war, . . . an attempt to "set class against class," which is, of course, a thing that the lights of Social Democracy have never dreamt of doing. It is also denounced as "an endeavour to create "a class of mere serfs under the delusive name of 'free "'labourers,' to alienate the affections of the working "people of this land from the leaders who, risen by sheer "ability from the ranks, have won so many victories for "labour, and have known how to use their success "with statesmanlike moderation," and so on. This tirade would doubtless amount to a serious impeachment of the organizers of the proposed Labour Exchange if only it were founded on fact. But how much of it is really true? There is nothing your demagogue hates more than to have his ravings discussed by the cold, unsympathetic light of common knowledge. But there is this advantage to be gained from newspaper advocacy of New Unionist principles and leaders. Statements recorded in print may in print be criticized and exposed if erroneous; and it is mere child's play in criticism to demolish this rhodomontade of the *Daily Chronicle*.

To begin with, since workmen are permitted to organize in defence of their own interests, it is ridiculous to call a similar action by employers an "insult." And when an employment agency poses as a fundamental principle its absolute indifference to Trade Unionism, is not this a more liberal policy than the guiding spirits of Unionism have ever adopted of their own free will? Of course, it may be argued that indifference to the possession of a Trade Union ticket by an applicant for registration by the Exchange is tantamount to discouragement of such bodies; but is this a penal offence? And might it not be met in any case by members of Trades Unions rigidly abstaining from having anything to do with the Exchange? Then, again, the contention of the organizers of the Exchange that the free labourers of the country, who have not seen fit to become members of a Trade Union, constitute 85 per cent. of the whole, is either true or false. The *Daily Chronicle* ignores this point, and talks of the endeavour of the projectors of the Exchange to "create a class" of workers of this order. Surely, if the "free labourers" of the country exist in any

great numbers—and they are notoriously in the majority—whose fault is it? New Unionism has been offered to them for years; and if they have failed to appreciate its beauties, why should they not be given an opportunity of benefiting themselves by other means? Where is the sense in talk about attempts to "alienate the affections" of working men from self-appointed "leaders" whom 85 out of every hundred have refused to support or have anything to do with? And who are these "leaders" who have "risen by sheer ability from the ranks"? Nobody would deny ability, of a kind, to Wilson, the lodging-house keeper, who made such wild work of the Seamen and Firemen's Union until he was checkmated by the Shipping Federation; but did he ever actually belong to the ranks of those upon whom he foisted himself? Was Tom Mann ever a "docker," or Aveling a gas stoker, or Mitchell Henry a "coalie," or Tillett a "general labourer"—in Bristol or elsewhere; and when John Burns made such a mess of the Manchester gas workers' strike, was he a son of that soil? Where, again, shall we look for the "statesmanlike modera-"tion" with which these men, demagogues all, and their even less "successful" associates of a lower grade—the Sprows, the Wards, and the Tower Hill performers—are reported to have used their success? Is it in the history of the South London gas strike, the Silvertown *fiasco*, the miners' and railway men's disastrous blunderings under their distinguished leadership?

It is not pleasant to repeat these things; but when one is assured that only 15 out of every hundred of the labourers of the country belong to Trades Unions, and when there is such ample reason for this, it is a little too barefaced for the spokesmen and wire-pullers of the minority to pretend to "rule the roost;" and in these columns at least their pretence is not to be permitted to pass unquestioned. Of course, we are accused of enmity to Trades Unions; but once more let us aver that this is not true, so far as the accusation implies antagonism on our part to the principle of combination by individuals for the purpose of securing legitimate benefits which, as individuals, they could not obtain so easily, if at all. Quite the contrary. We believe in this principle; and we have advocated it warmly and often. We are not so bemused by admiration of any principle, however, as to ignore every consideration of how it is worked in practice, by whom it is worked, and the purposes for which it is worked. With regard to Trade Unionism, we admit that the idea is good. Unhappily, however, its application has fallen too often into the hands of men unfitted for the exercise of power by reason of their ignorance, incapacity, want of good faith, or other sufficient cause for withholding confidence from them; and we utterly refuse to accept leather lungs, command of the tricks of demagoguery, a knack of self-advertisement, or even good intentions unaccompanied by wisdom, as satisfactory substitutes for those sterling qualities of the head and the heart which are essential for all leaders who are worthy to be held in honour, whether the movements with which they are identified are classified as "New" or "Old," and whatever the composition and aim of their following.

The Paris Gas Question—Collapse of the New Convention.

On several occasions we have noticed the negotiations that have been in progress between the Paris Municipality and the Gas Company for a new Treaty to replace the existing concession, which will expire in 1905. After many futile attempts, it has appeared during the past month or two that a basis of agreement had been discovered, upon which the high contracting parties could construct what seemed to them something like a satisfactory scheme for the future administration of the gas supply of the French capital. We discussed the new project in these columns on Oct. 18 last; and while recognizing the difficulty which past blundering has placed in the way of cheapening gas in Paris, we still professed ourselves unable to admire the methods favoured by the framers of this scheme. It is with less regret, therefore, that we now record the collapse of the negotiations, which results from the decision of the Municipal Council on the 6th ult. to postpone *sine die* the discussion of the proposed new "convention" with the Gas Company. In one sense, this is a regrettable termination to a protracted exercise in diplomacy; but the reflection that there is nothing to prevent the whole thing from being opened up again to-morrow upon a new footing, will doubtless be consolatory to the worthy and industrious gentlemen who find profitable employment in this kind of exercise. The beauty of the situation consists in the necessity for such recommencement; the question of how the gas supply of Paris is to be carried on after 1905 being as insistent as the riddle of the Sphinx. With the fact of the approaching lapse of the existing Treaty before them, neither the Municipality nor the Gas Company can afford to let matters take their own course; and so it may be expected that the game of negotiation will soon be commenced again. If only both parties can start fair, and keep clear of unnecessary complications of the issues before them, such as marred the last convention, there is no real reason why a just settlement should not be arrived at.

It will naturally be asked why the agreement, which only needed formal ratification by the Municipal Council in full session, failed at the eleventh hour to justify its framers; but to this question it is hardly possible to return a simple answer. Ostensibly, the negotiation was broken off because the Prefect of the Seine, who had entertained scruples in regard to the future ownership of the distributing plant upon the expiration of the existing Treaty, and addressed an inquiry on the subject to the Company, had received an unsatisfactory response. It seems that the wonderful Treaty of 1870 is susceptible of various readings; and whereas the Municipality were under the impression that, upon its determination by efflux of time, all the distributing plant of the Gas Company will become public property, the Company have been differently advised. Such a difference is enough to upset any negotiation; and in this case there was no possibility of "harking back" for the purpose of inserting an allowance for the uncertainty. Consequently, there was nothing for it but to make waste paper of the whole record. Really, we entertain the suspicion that the Municipality and the Prefect are not altogether sorry for the opportunity of drawing back from a compact which did not improve upon prolonged inspection. It would have suited the Gas Company well enough. But it contained several irrational and fanciful provisions which would have proved unworkable in practice; and other complications might easily have arisen to reflect anything but credit upon the politicians who were responsible for this important piece of municipal legislation. The apologists for the Company claim that, in assisting to settle the terms of the now exploded convention, the Directors manifested "the widest views and the greatest "disinterestedness compatible with defence of the "important interests which they represent." Unfortunately, the present state of the gas supply of Paris does not say much for the width of the views that have led up to such a condition of affairs; and, with the irritating example of Brussels before them, the heads of the Paris Municipality are not to be blamed for making very sure of their ground before they sign away the advantage conferred by the approaching lapse of the existing concession, and condemn the gas consumers of Paris to another quarter of a century of iron-bound subjection to an unimprovable Treaty.

The "Engineer" Complains.

It appears that we have seriously offended our highly respectable contemporary the *Engineer*, by the observations we permitted ourselves to make in these columns, on Nov. 29 last, respecting a certain article that appeared in our said contemporary, and was reproduced in the *Journal of the Society of Chemical Industry*, which presumed to tell gas managers something that they did not know before about the advantages of gas producers. Not to put too fine a point on it, we thought the whole article poor stuff, and wrote irreverently of it as being an "artless compo-"sition." For this we have been solemnly castigated by our outraged contemporary, which even goes so far in its attempt at a dignified protest as to pour out contempt upon the Journal and the industry which it represents in the following remarkable passage: "With all respect "to honest ignorance, we cannot undertake to accompany "every leader with a glossary and explanatory appendix "for the benefit of a mere fraction of our readers, and "that the least considerable in every sense." This is as severe as anything ever uttered across a respectable teatable respecting some grave parochial misunderstanding. Well, if our usually placid contemporary scorns us, we must endure the blight as best we can. But what is the meaning of this outburst? Have we misread our author, and so driven him upon the stilts of oracular disdain?

The article professed to "demonstrate the existence of a "field for the use of the producer in gas making," according to the later statement; and it also declared that the possibilities of producer gas were "in danger of being com- "pletely ignored" until Professor Emerson Reynolds said something about the subject last July. When a writer mentions producer gas, we assume him to mean what is generally meant by the term; and we accordingly scouted the pretension of the *Engineer* writer (whether for himself or for Professor Reynolds) to have "demonstrated" anything at all about a matter so perfectly familiar to gas engineers as the producer and its capabilities. We are now informed that the term "producer" was used in the article referred to "in the widest sense." But what of it? Is there any particular suggestiveness in writing "at large" about such a well-known appliance that our contemporary should plume itself upon such a style of treating the subject? Perhaps when the *Engineer* sees this response to its attempts to be scathing, it will deign to so enlighten our "honest ignorance" of the use of producers as to explain how "producer gas" is to be "enriched" by the use of "steam or carbon dioxide." By the time this is made plain, and it is further understood that when a technical writer speaks of "producer gas" he may be understood to mean anything and everything that comes out of a cupola as distinguished from a retort, we may perhaps be willing to admit that, when the *Engineer* says anything about gas making, no little dogs, such as ourselves, should bark.

A Lesson in Competition.

A STRIKING bit of history, exemplifying the result of competition in gas supply, is reported from the important City of Detroit, Michigan. For many years the town was served by one Company; but fifteen or twenty years ago, Mr. Thompson Dean, a gas-works "operator" of Cincinnati, obtained a municipal charter upon very liberal terms for an opposition undertaking. He formed a Company, calling it the "Mutual," probably in commemoration of the arrangement between himself and the Local Authorities of which the speculation was the outcome. As soon as the Mutual Company began to supply gas, the usual "war "of rates" arose between the two rival undertakings, the campaign lasting for five years, after which period a district- ing agreement was concluded between the contending interests, and the era of cheap gas came to an end. Undeterred by their experience, the Detroit people once more invoked competition with a view to reducing the price of gas in the city; and accordingly the Michigan Gas Company, which started as a natural-gas concern, invaded the town. The third network of pipes gradually spread over the whole of the Detroit district; but only a short time elapsed before the owners of this supply discovered that this source would not be sufficient to meet the demands upon it, and they had to cast about for some artificial reinforcement. Of course, the new-comers were formally debarred, by the terms of their charter, from directly uniting with either of the older Companies; but, equally of course, this did not prevent a fourth Company from being formed for the purpose of securing an "option" upon the plant of the old Detroit Gaslight Company, and eventually establishing a financial and physical connection between this and the *pseudo* natural-gas undertaking. Lastly, the Mutual Company has been bought up in a private "deal," for a sum probably double the cost of the venture to the original promoter, including all the waste due to the war of rates; and at the present moment the gas consumers of Detroit find themselves saddled with twice or three times the gas capital that would have been required for the supply of the town under any sensible system of local administration. A few smart "operators" have made fortunes out of these various transactions; and the peculiar liability of American institutions to encourage the most expensive way of performing public services is once more illustrated.

An Original New Year's Card.—Mr. Charles Hunt, President of the Incorporated Institution of Gas Engineers, has sent to the members of the Institution an original description of New Year's card, designed by Mr. F. D. Marshall, of Copenhagen. It is a clever composition, and deserves to rank as an interesting souvenir of a not uneventful year in the annals of the industry; being a humorous pictorial skit upon many contemporary incidents and persons, from the pencil of a caricaturist of marked ability, whose knowledge, as an engineer, of gas matters is as profound as his perception of the ridiculous side of them is keen.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 28.)

THE closing week of the year, with the Christmas holiday behind it and the shut New Year's Day before, is never a very interesting one beyond the business of the settlement. Last week was no exception to the general rule; but still, notwithstanding paucity of attendance and lack of enterprise, the tendency was rather favourable. Consols and other gilt-edged luxuries were particularly firm. The settlement, which was a light one, went through satisfactorily; and no difficulties inaugurate the New Year. The Money Market remains easy; and there is nothing in the financial horizon to indicate a change. The Gas Market has been very quiet. With one important exception, the tendency is very good; and the chief issues continue to advance in value, with every probability of a further rise. Gaslight "A" has gained 2 more; and the final mark was 224½. The demand for investment stocks keeps the secured issues well up. Little business was done in South Metropolitans; but they are all a trifle dearer. Commercials were quiet and unchanged. Nothing occurred in relation to Suburbans and Provincials to call for remark. Of the Continentals, only Imperial was touched, and that suffered a relapse. None of the rest present any noticeable feature. Water was proportionately more active than Gas, and quite as firm. Those Companies which are now quoted *ex div.* show some moderate gains on adjustment of quotations.

The daily operations were: Gas was very quiet on the opening Tuesday; but the prices of everything dealt in were very good at the closing quotations of the previous Friday (on which day the following changes had taken place: Gaslight "A" rose 1; South Metropolitan "A," 1; ditto "C," 2; but Imperial Continental fell 1½). On Wednesday, a couple of deals in Gaslight "A" were all the business of the day. Thursday was slightly more active at unchanged figures. Friday fell off in point of activity, but showed more movements in price. Gaslight "A" and South Metropolitan "B" rose 1 each; but Imperial Continental receded 1. Saturday was almost a *dies non*; and all quotations remained unchanged.

In accordance with our usual practice, we append a comparative table of the quotations of Gas and Water securities at the close of 1892, and as they were twelve months before—showing their respective gains and losses. It will be seen that, among the Gas Companies, movements have been so irregular as almost to defy grouping and classification; issues which might be expected to rise or fall together having taken opposite courses. Upon the whole, however, the gains more than counterbalance the losses. A considerable proportion of the former is found among the debenture and preference stocks—a fact which is referable to the great demand for choice investment stocks which has lately prevailed. The fortune of the Water Companies has also been somewhat chequered; but their position on the whole is satisfactory. Last March they were intensely depressed by the fear of active hostilities on the part of the Public Authorities; but they have since then recovered in a very marked manner.

NAME.	Prices on Dec. 31, 1891.	Prices on Dec. 31, 1892.	Gain or Loss.
GAS COMPANIES.			
Alliance and Dublin Company, 10 per cent. maximum	15½—16½	16—17	+½
Do. 7 per cent.	11—12	11—12	—
Australian (Sydney) 5 per cent. Debentures	107—109	105—107	−2
Bahia, Limited	12—14	11—12	−1½
Bombay, Limited	6½—6¾	5¾—6¼	−½
Do. New	4¾—5	4—4¼	−¾
Brentford, Consolidated	210—220	212—217	−½
Do. New	157—162	163—168	+6
Brighton and Hove, Original	40—42	40—42	—
Bristol	98—103	103—106	+4
British	42—44	41—43	−1
Bromley, ordinary 7 per cent.	13—15	14½—15½	+1
Buenos Ayres (New), Limited	6—7	7½—8½	+1½
Do. 6 per cent. Debenture	92—96	99—102	+6½
Cagliari, Limited	24—26	25—27	+1
Commercial, Old Stock	240—250	232—237	−10½
Do. New do.	185—195	180—185	−7½
Do. 4½ per cent. Debenture Stock.	117—122	120—125	+3
Continental Union, Limited	215—225	220—225	+2½
Do. 7 per cent. Preference	185—195	187—192	−½
Crystal Palace District	190—200	185—190	−7½
European, Limited	19—20	19½—20½	+½
Do. Partly paid	14—15	14—15	—
Gaslight and Coke, A, Ordinary	219—224	221—225	+1½
Do. B, 4 per cent. maximum	94—97	95—98	+1
Do. C, D, and E, 10 per cent. Preference	248—253	260—265	+12
Do. F, 5 per cent. Preference	118—123	116—121	+2
Do. G, 7½ per cent. Preference	172—177	166—171	−6
Do. H, 7 per cent. maximum	155—160	161—166	−6
Do. J, 10 per cent. Preference	245—250	257—262	+12
Do. K, 6 per cent. Preference	145—150	152—156	+6½
Do. 4 per cent. Debenture Stock.	110—114	117—120	+6½
Do. 4½ per cent. Debenture Stock.	118—123	122—125	+3
Do. 6 per cent. Debenture Stock.	160—165	163—168	+3
Imperial Continental	220—224	219—223	−1
Malta and Mediterranean, Limited	4—4½	4—4½	—
Metropolitan of Melbourne 5 per cent. Debenture Stock	109—111	107—109	−2
Monte Video, Limited	15—16	14½—15½	−½
Oriental, Limited	8¾—9	8—8½	−½

NAME.	Prices on Dec. 31, 1891.	Prices on Dec. 31, 1892.	Gain or Loss.
GAS COMPANIES.			
Ottoman, Limited	4—5	4—4½	—½
Pará, Limited	2½—3½	2—2½	—1
People's Gas of Chicago, 1st Mtg. Bds.	94—99	103—107	+8½
Do. 2nd do.	93—98	100—105	+7
San Paulo, Limited	11—12	8¾—9½	—2½
South Metropolitan, A Stock	265—275	288—293	+20½
Do. B do.	220—225	235—239	+14½
Do. C do.	225—235	245—250	+17½
Do. 5 per cent. Deb. Stk.	138—143	140—144	+1½
Tottenham and Edmonton, Original.	220—260	225—230	—12½
WATER COMPANIES.			
Chelsea, Ordinary	250—260	245—250	—7½
East London, Ordinary	202—207	202—206	—½
Do. 4½ per cent. Debenture Stock	136—140	141—144	+4½
Grand Junction	98—103	104—108	+5½
Kent	265—275	275—280	+7½
Lambeth, 10 per cent. maximum.	220—230	217—222	—5½
Do. 7½ per cent. maximum.	189—194	189—193	—½
Do. 4 per cent. Debenture Stock	120—123	123—128	+4
New River, New Shares	335—345	325—330	—12½
Do. 4 per cent. Debenture Stock	125—127	132—135	+7½
Southwark and Vauxhall, 10 per cent. max.	147—152	148—153	+1
Do. 7½ per cent. maximum	138—143	135—140	—3
West Middlesex	245—255	237—242	—10½

ELECTRIC LIGHTING MEMORANDA.

The Outlook for Central Station Electric Lighting Companies—Suggestions for Improvement—Woodhouse and Rawson Affairs—The Street Lamp Extinctions in the City of London.

It can hardly be claimed by the most optimistic partisan of electric lighting, regarded as an industry, that the New Year opens promisingly for its prospects of becoming a popular investment and a profitable occupation. It is true that there are more electric lamps in use in the United Kingdom than there were at this time last year; but, with few exceptions, central station lighting undertakings have made disappointingly small progress during the past twelve months in consolidating their business. Getting fresh customers here and there is not necessarily a profitable process; and there must be a general closing of capital accounts before it can be seen for certain whether central station lighting is worth doing outside a few favoured localities where its success, at a price, has been generally taken as proved. There is still far too much of the speculative element about many professedly settled undertakings of the kind, to permit of their being regarded as firmly established upon the basis of earning a living by the sale of electricity. The financier has left his trail over too many of them for electric lighting everywhere to be treated simply as a branch of trade conducted solely with reference to ordinary commercial considerations. Where the promoter has left so deep a mark, there is always an opening for the liquidator to enter.

The uneasiness of the leaders of the electrical industry, in view of the sluggishness of central station undertakings in demonstrating their fitness for carrying on the struggle for existence free of financial leading strings, has shown itself in the form of various suggestions for alterations in the system of charging for current, as well as for modifying distribution methods. Dr. Hopkinson has proposed a system of charging for current providing compensation for the cost of being ready to supply the maximum demand, which in the absence of any economical means of storeage, is such a heavy burden upon a central station undertaking. His idea is that a consumer having (say) 1000 lamps on circuit, and habitually using only 100 lamps should pay more *pro ratâ* for the current supplied to the latter than if these represented his maximum possible demand upon the resources of the central station. The point is well taken; but the difficulty in the way of carrying out Dr. Hopkinson's suggestion, or any other proposal with the same object, lies, as Major S. Flood-Page has pointed out in the columns of a contemporary, in the fact that any such scheme must be, to all intents and purposes, a matter of preferential discounts. Even if a preferential discount might be legally given to those whom the electrical undertakers would regard as their best customers, "the difficulties of arranging these preferential charges, and the still greater difficulty of making the general public understand them," would render their working so troublesome that no such plan of conducting business could long be persisted in. The St. Pancras Vestry have commenced the experiment of charging half price for day supplies of current; but this is regarded as a palliative of the evil of unequal loading of the generating plant, which may have some effect in certain localities, but is not of universal applicability. Moreover, it is recognized that the necessity under which all electric lighting undertakings lie, of competing against gas, with the "sweet simplicity" of its rental as determined by meter, debars the former from indulging in fancy methods of charging. With reference to the other reform suggested for the consideration of electrical supply companies, it bears only upon the low pressure, three-wire system of distribution, and consists in "earthing the middle," which is a mysterious piece of counsel supposed to be pregnant with great possibilities of efficiency and economy. This is a subject upon which we cannot pretend to offer any comments.

The speculative element in electrical ventures was brought into unhappy prominence at the very close of last year by the publication of the accounts of Woodhouse and Rawson United, Limited, and the proceedings at the meeting of the Company, which together form as distressing reading for those unfortunate persons who happen to be pecuniarily interested in this well-known concern, as the deplorable chronicles of electrical speculation have ever supplied. The accounts of the Company not only show a balance on the wrong side of profit and loss of some £86,700, but reveal a sad history of putting off the day of reckoning to the uttermost. After the Chairman and Managing Director had entertained the meeting with their explanations and excuses, the stage was cleared for a fresh personage at assemblies of this character—the "candid friend"—played on this occasion with conspicuous ability by the leader of the Parliamentary Bar, Mr. Pope, Q.C., who secured the confidence of the shareholders by avowing himself, although a Director, "thoroughly ashamed of the balance-sheet." The condition of the Company was admitted by the Board to be desperate; and there was no general disposition on the part of his colleagues to stand by Mr. Pope in his determination not to run away from a concern because he found it to be in a disastrous condition. It is safe to say that if all directors of joint-stock companies had the public virtue of Mr. Pope, there would not be such scandals as have too frequently arisen to cast reproach upon the whole class. Thanks largely to Mr. Pope, a step has already been taken which may preserve Woodhouse and Rawson from immediately going the way of so many other concerns that have made the name of electrical enterprise a cloak for operations in company promotion. Whether the Company will finally emerge from its troubles with a safe, steady-going manufacturing business, is not for us to say. Its only way of escape from bankruptcy lies in this direction; but while this may be recognized at headquarters, it by no means follows that the load of speculative ventures can be dropped quickly enough to save the factory. Woodhouse and Rawson complications have been a byword for years; but it is only too probable that, in this case, the trick of propping up one subsidiary company by another, and ringing the changes between vendor and purchaser concerns, has been played out.

It is natural that the failure of the arc lamps of the City of London Electric Lighting Company in some of the most important City thoroughfares, on the night of Sunday the 18th ult.—which cast a gloom, in a double sense, over the district handed over to the Company—should have attracted a considerable share of public attention. Coming as it did upon the heels of the report that the gas-lamps in these districts are about to be dismantled, this failure of the electric lamps must be held to have been particularly well timed. Our narrative of the incident was given upon the best authority, but it has been described in the *Pall Mall Gazette*, by the management of the City of London Electric Lighting Company, as being "grossly exaggerated." We have been at some pains to ascertain in what the exaggeration consists, but in vain. Indeed, the only particulars vouchsafed in defence of the performance of the Electric Lighting Company on this occasion, admit the main facts. We stated when and where the electric lamps went out; the Company confesses that "a few street lamps were certainly out on Sunday evening, the 18th inst." It is added that this was not due to any fault of the "system," but to trouble with a few lamp trimmers. But whoever said a word against the system of the City of London Company? Is it not enough that their lamps failed to show the light expected of them, and that gas—which is not permitted the luxury of a theoretically perfect "system"—had to be resorted to in order to save the City from darkness? Electricians are wonderfully touchy as to their "systems," which is just what the general public neither know nor care anything about, so long as they can have a light whenever and wherever it is wanted.

Death of Mr. J. P. Brunner.—The death is announced of Mr. J. P. Brunner, a member of the firm of Messrs. Brunner Mond, and Co., the well-known chemical manufacturers. The deceased gentleman, who was in his 49th year, was a Magistrate of Liverpool.

The Coal-Fields of Scotland.—We have received from Messrs. J. M'Kelvie and Co., of Haymarket, Edinburgh, a very interesting map of the coal-fields of Scotland. The principal carboniferous rocks—the coal measures (including upper red sandstones), millstone grit, and carboniferous limestone series—are indicated by different tints; the outcrops of coal being marked by red lines. The map shows at a glance the richness of the South of Scotland in the raw material of gas manufacture. It is drawn to a scale of two miles to an inch; and as it bears the name of the Edinburgh Geographical Institute, it is needless to say anything as to its execution. It is mounted on canvas, and varnished.

The New Railway Rates.—The new scale of charges for the conveyance of merchandise by railway, which was settled by Parliament after the protracted inquiry conducted by Lord Balfour of Burleigh and Sir Courtenay Boyle, came into operation on the 1st inst. The rates in force under the old system were usually governed by what was known as the "Normanton scale;" but under it no account was taken of special rates or rebates. It has been computed that the new maximum rates are about 12 per cent. below the Normanton scale rates; but where terminals are now to be charged for the first time, they will, it is stated, more than make up the difference, especially in short-distance traffic. The railway companies will in future carry coal at 20 cwt. instead of 21 cwt. to the ton; but 2 cwt. per truck will be allowed for wasteage, instead of 1 cwt.

THE DIFFUSION OF LIGHT IN ROOMS.

It is a satisfactory thing that the problems of light and lighting are just now attracting marked attention on the part of independent workers in science; the latest proof of this renewed interest of scientific men in a class of subjects that has suffered undeserved neglect of late years being a paper on "The Diffusion of Light," recently read by Dr. W. E. Sumpner before the Physical Society. An abstract of this paper will be found elsewhere; but we propose here to discuss the subject generally, with reference to its bearing upon the use of artificial lights. Dr. Sumpner's paper was a very learned essay in applied mathematics; and little good would be served by our publishing it in full. Those who are sufficiently interested in the matter to follow up the methods by which this author has attempted to fix definite values to phenomena not wholly unfamiliar to working photometrists may be referred to the original text as it will appear in the Society's *Journal*.

Dr. Sumpner has found it necessary to begin his work with some definitions of terms, as everyone must do who seeks to concentrate his ideas upon certain mutual relationships of quantities in a science which is afflicted with many loose and some irrational terms. We may accept his definition of the reflecting power of a surface as "the ratio of the amount of light reflected by it, to the total amount of light incident upon it." Also, it is understandable that the illumination of a surface is "the amount of incident light per unit area of the surface." But when Dr. Sumpner comes to the definition of the unit quantity of light, we get it as "the flux of radiation across a unit area of a sphere of unit radius at whose centre a unit light is placed." This is correct; but it is hardly so obvious as could be desired of a definition. Then it follows that the total quantity of light emitted from a source is $4 \pi k$; the co-efficient k being the candle power of the source. Here we have the old anomally of one candle giving the total quantity of 12·6 candle light, which is mathematically correct and actually absurd.

Dr. Sumpner proceeds to investigate the part played by diffusion from walls and ceilings in the lighting of a room; and he brings out the important truth that the illumination due to this secondary source may be far more considerable than that caused by the direct rays of the lights. This relation between the radiation from a light-source and the diffusion of light from walls, has been well brought out by Mascart. The present author seeks an expression for the average reflective power of enclosing surfaces of different reflecting capacity; and he finds one which is very approximately true for ordinary rooms, and may be shown to be quite accurate for a spherical enclosure. Dr. Sumpner takes as an average case for rooms a reflecting power of 70 per cent. for the ceiling, 40 per cent. for the walls, and 20 per cent. for the floor, when the increase of illumination by reflection becomes as much as 70 per cent. (These data should be taken into consideration in connection with the practical rules for lighting given by Mr. W. H. Y. Webber.*) If the walls and ceiling of a room are well whitewashed, the average reflecting power will not fall far short of 80 per cent.; and in such cases the illumination due to diffused reflection is four times as important as that caused by the direct action of the lights in the room. A further great advantage resulting from the selection of good diffusing surfaces arises from the fact that the illumination they give is in most cases very nearly constant all over the room, and does not cast shadows.

The foregoing observations tend to show how deceptive all calculations of lighting effect may be when they are unaccompanied by due references to the nature of the ceiling, walls, and floor of the apartments intended to be illuminated. Computations depending upon the proportion of light afforded to the cubical contents of the room are evidently misleading, since what would be sufficient lighting for an apartment with a polished, or light-coloured floor, bright walls, and a whitened ceiling, would be altogether unsatisfactory in case the ceiling were replaced by a dark wooden roof, to say nothing about the effect of panelling or deep-toned paper upon the walls, and carpets on the floor. The presence or absence of directly reflecting surfaces, such as mirrors, also has a serious influence upon the lighting of a room. The same remark applies to the spreading of a white cloth upon a dining-table, with the addition of plenty of sparkling silver and crystal, and to the effect of covering a ball-room floor with almost white "dancing holland."

The problem of successfully lighting a room is naturally affected by the uses to which the apartment is likely to be put. It is a problem that is also answered differently at different epochs. During the early Victorian period, the ideal of good lighting was universal glare. Even for drawing-rooms the style of lighting and decoration described in "Jane Eyre" as a mixture of snow and fire, meaning the conjunction of glistening white walls and ceilings with crimson rugs, Bohemian glass lustres, &c., was regarded as the height of elegance. It is a pity, from the electricians' point of view, that the new order of arc lamps did not come into use while these ideas of interior decoration prevailed. One can very well understand that a few arc lamps would have been esteemed the very thing for a cheerful apartment decorated and upholstered after the "snow and fire" model. Unfortunately for themselves, the triumph of the electricians did not come until the fashion in decoration had veered round to the opposite extreme. Instead of white walls, glittering ceilings, and big mirrors reflecting lights to infinity, the last quarter of the present century saw a revival of the fancy for gloom and mistiness in the decoration of interiors. Until very recently, no lady or gentleman who pretended to "taste" would have had a reception-room painted or papered in anything but some sombre tint of sage green. Whitened ceilings were looked upon with horror; all decoration was in tertiary tones of colour, and dull panelling and dingy tapestry were worshipped with a devotion that was all the more intense for being unreasoning.

It is really no easy matter to effectively light an apartment deliberately rendered dingy by darkening the ceiling and banishing every reflecting surface from the walls. People who went crazy over panelled chambers, and made every room as frowsy and dull as possible by reverting to wall hangings of severe aspect, forgot that the present generation wants to read, and sew, and see people's faces after nightfall, which the earlier races who had recourse to tapestry as a means of correcting the chilliness of stone walls never felt the necessity of doing. Consequently, these darkened apartments had to be lit upon a scale altogether unknown to the originators of the style of decoration; and then the trouble began. The "snow and fire" style of rooms was horribly lacking in that restfulness which constituted the only charm of the later fashion—a charm not to be despised in proper places; but at least they were easy to light. It was a strange room that could not be finished off satisfactorily, in and about the forties and fifties, by a crystal or a crystal and gold "chandelier" of the well-remembered type. Where are those chandeliers now?

And it must be borne in mind that the system of lighting by massed lights which was exemplified in the chandelier, was perfectly consonant with the light tone of the prevailing fashion of decoration. To be shadowless was the great distinction for rooms decorated and lit in this fashion. Light was everywhere; and the glory of the central luminary—itself as shadowless as construction of the most transparent material could make it—was diffused from every plane bounding the illuminated enclosure. Peoples' eyes were dazzled upon their entry into such an apartment; but this effect was actually desired. Everything was to be sparkling, *eclatant*, astonishing. Repose? For this one would have been directed to the sleeping apartments. In the reception-rooms, people were expected to keep their eyes open; and, if the dazzling radiance of every object caused the pupil to shrink to a pin-point, and showed the iris at its widest, so much the better.

With the return of dark colours on walls, ceilings, and floors, the days, or rather the nights, of the chandelier passed away. Massed lights were patently out of place where there were no means of diffusing their effect. People did not use chandeliers because the greatest amount of light was wanted in the middle of the room, or wherever the chandelier might happen to hang, but only because a certain quantity was necessary, and it might as well be had "in the lump," so to speak, as otherwise. Wherever it originated, there would be no difficulty about its diffusion. When the reflecting walls and ceiling had vanished, it became necessary to distribute the lights where they were wanted. In a word, the local effect had to be considered, instead of the general appearance. Of course, it was possible to make a room look very pretty when lit up by scattered lights. The addition of shadow and of *chiar'oscuro* to the decorator's resources was a noteworthy reinforcement; but the effect was no longer the same. The use of powerful light-sources fell out of favour for reception-rooms; and reading and writing were done by isolated lamps.

The fashion of dimness never invaded ball-rooms or places of public assembly, for various reasons. A dingy ball-room is almost a contradiction in terms; and an auditorium must not be made gloomy on peril of inducing sleep on the part of the occupants. A change has come over the lighting of theatres, however, during these post-Wagnerian days; the proscenium being much more markedly the centre of illumination than was formerly customary. And it is with no small satisfaction that we are able to report that the tyranny of sage-green in the decoration of domestic interiors is overpast. Now-a-days, a man who likes brightness in his drawing-room may have it without reproach. Tender pinks, blues, and sea-greens are to be seen once more in reception-rooms and boudoirs; while pale yellows and broken whites are asserting their claims only too strenuously for householders who cannot afford to refurnish in a new "key" every few years. The result of this revulsion of fashion in regard to lighting is clear. It will lead to a revived demand for massed lights and for light-sources of comparatively high illuminating power. All things being equal, it is obviously more convenient to have one light in a room instead of two; and so it will be found when restored means of diffusion render the extreme subdivision of lights no longer necessary. But it is not to be believed that the Early Victorian "chandelier" will ever return to favour among householders with any pretension to taste. We all know that impostor of a chandelier, with its sham oil-reservoirs containing nothing, and all its working parts pretending to be something different from their true office. Never has there been seen anything more hideous than this chandelier, except the sham candles of the modern electrician stuck into imitation Oriental vases. Massed lights are certainly coming in again; but they will not be in the same shape as of yore. So wonderful is Fashion,

* See JOURNAL, Vol. LIX., p. 292.

which, even in repeating itself, does so "with a difference" quite sufficiently marked to prevent the cast-off style of one period from being furbished up anew. We are not sorry that circumstances are once more rendering it incumbent upon lighting specialists to take account of the effects of reflection from surfaces which have been deprived of this quality at the dictates of an arbitrary mode. Gas lends itself well to illumination in the mass; and with the return of a liking for cheerfulness in the night aspect of living-rooms, the popularity of the most cheerful of lights must necessarily increase.

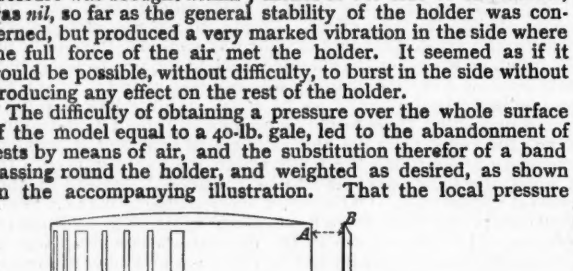
COMMUNICATED ARTICLE.

EXPERIMENTS ON THE STRENGTH OF GASHOLDERS CONSTRUCTED OF BROWN PAPER.

We have received from Mr. E. Lloyd Pease, the Managing-Director of Messrs. Ashmore, Benson, Pease, and Co., Limited, the following communication, giving the results of some experiments which his firm have recently made, and which he thinks may be of interest to our readers as they were to themselves. He says it will be seen that the design has been to test the strength of a small gasholder constructed of very light material, and to gain some idea of the strength of the sides of a holder alone by constructing it without any rigid stays. He adds that opinions will probably differ as to whether the results disclose anything of value; but he thinks they show that the side of a gasholder has greater strength than is generally credited.

From correspondence that has lately appeared, it might be concluded that a gasholder could not, without outside support, possibly stand against heavy wind pressure. In order to determine, if possible, whether there was just foundation for this theory, the following experiments upon two holders were undertaken. Although two holders were experimented with, it is not necessary to say more about the smaller one than that it was made entirely of brown paper, with a wooden top curve and the bottom part of zinc sheets, so as to keep the paper out of the water. The diameter was 12 inches; and the height from the zinc, 15 inches. Among other ways, it was tested as follows: When inflated with air at a pressure of 3 inches of water, the holder being held down by weights on the bottom curb, it was subjected to the full force of air from an air-main working at 60 lbs. per square inch. The result, when the air pressure was brought within 7 inches of the side of the holder, was *nil*, so far as the general stability of the holder was concerned, but produced a very marked vibration in the side where the full force of the air met the holder. It seemed as if it would be possible, without difficulty, to burst in the side without producing any effect on the rest of the holder.

The difficulty of obtaining a pressure over the whole surface of the model equal to a 40-lb. gale, led to the abandonment of tests by means of air, and the substitution therefor of a band passing round the holder, and weighted as desired, as shown on the accompanying illustration. That the local pressure



applied in the above test was great, may be gathered from the fact that the pressure in the pipe (which was two inches in diameter) was 60 lbs. per square inch, and the distance 7 inches. The actual value of this experiment was small; but it tended to support the propositions to which the experiments on the larger holder led—viz.:

(1) That a holder constructed with sides of light material only is strong enough to meet any force to which it will be subjected.

(2) That if a holder constructed in this manner should collapse, it would be by being blown in on the windward side.

(3) That the possibility of blowing in a holder in this manner depends on the resistance of the gas inside the holder; and this varies in proportion to the pressure exerted by the holder.

Experiments with a 5-feet Holder.

The holder was constructed of waterproof brown paper, a strip of which 1 inch wide broke with a load of 21 lbs. It had light angle-iron curbs at top and bottom; and in the middle, to form a joint between the two pieces of paper, there was a light hoop-iron ring. The height from the top of the zinc sheet to the top curb was 3 feet. No supports of any kind were used in the construction of the sides; their strength being just sufficient to stand in a buckled condition when the holder was uninflated. This should be considered when regarding the following tests.

Experiment No. 1.

Distance between A and B—	Inches.
Without inflation	$6\frac{7}{16}$
" " (with weight of 100 lbs.)	$6\frac{1}{16}$
When inflated, with 2-inch pressure " " "	$6\frac{7}{16}$
" " with 3-inch pressure " " "	$6\frac{3}{4}$
" " " " (without weight)	$6\frac{11}{16}$

It will be seen that, when the model was supporting 100 lbs. and was *inflated* with 2-inch pressure, it stood as erect as when unweighted and uninflated; and that, when inflated with 3-inch pressure, it stood more erect than originally by $\frac{5}{16}$ inch, although supporting 100 lbs.

Experiment No. 2.

With 3-inch water pressure inside holder.

	Inches.
With a weight of 100 lbs., distance A to B	$6\frac{3}{8}$
" " 176 " "	$6\frac{5}{8}$
" " 232 " "	$6\frac{1}{16}$
" " 300 " "	6 bare

These measurements only compare amongst themselves, as they were taken to a different point in the bar. The weights could not be increased in this experiment, owing to the lifting of the holding-down weights on the bottom curb at X; thus causing the holder to come over bodily to the same extent that it departed from a level position. There was, however, no appearance of distortion in the holder other than that directly due to the weight it was carrying.

Experiment No. 3.

With a weight of 340 lbs. and 3-inch pressure inside—	Inches.
Distance A to B	$6\frac{5}{8}$
" C to D	$5\frac{3}{4}$
" E to F	$7\frac{7}{16}$
With a weight of 340 lbs. and 5-inch pressure inside—	
Distance A to B	$6\frac{9}{16}$
" C to D	$6\frac{1}{16}$
" E to F	$7\frac{1}{2}$

Thus it will be seen that the brown paper holder not only withstood the great strain of 340 lbs., but, when inflated with air at 5 inches of water pressure, was more truly erect in position than when standing in a free and uninflated condition, as $6\frac{9}{16}$ inches is to $6\frac{7}{16}$ inches.

The Distortion of the Holder.

In the first place, it must be remarked that in no case when the holder was inflated was any distortion observable in the upper half above the hoop iron, on the windward side, if it may be so called, or on the lee side, with the exception at E of a well-defined buckle immediately above the zinc. With 300 lbs. and 3 inches of water, this buckle extended about one-sixth of the circumference, and at its deepest point was $\frac{3}{8}$ inch deep—going off to nothing at each end. With 5 inches of water pressure inside, the buckle disappeared.

By far the most marked disturbance in the sheeting was in the sides at right angles to the direction of the force. This may be described as taking the form of corrugations, about eleven in number, on each side, running up from the zinc line at an angle of rather less than 40°, and dying out before reaching half way up the holder. With 3 inches of pressure and 340 lbs., the extreme depth was $\frac{1}{2}$ inch. This was reduced by $\frac{1}{8}$ inch with 2 inches more pressure inside the holder.

The most marked disturbance sprang from a point about 12 inches from G; and it appeared likely that the destruction of the holder would take place at this point (H on the illustration) through the tearing of the paper.

The experiments of which the foregoing is an epitome showed that the brown paper holder without vertical supports was able to stand against a force equal to a 45-lb. gale, if the weight was evenly distributed on the windward side. They also showed that, with an increased pressure inside the holder, the sides were able to withstand an increased pressure from without. This leads to the proposition that any holder constructed of sheet iron (or what would be better steel) would have sufficient strength to resist the force exerted against it by the wind, unless it were to fail by being blown *in*. The outward pressure of the gas bears very importantly on this point, for it must be overcome before any strain can be brought to bear on the sheets.

Resignation of the Secretary of the Birmingham Corporation Water Department.—Mr. Thomas Starkey, the Secretary of the Birmingham Corporation Water Department, after valuable services in connection with the water supply of the city extending over 39 years, has determined to resign his position. He was Secretary to the old Water Company for 22 years; and since the transfer of the undertaking in 1876, he has continued to act in the same capacity under the Corporation. Mr. Starkey will still perform the duties of the office until the appointment of his successor; and the Water Committee propose that, after 1893, he shall receive a retiring allowance of £400 per annum.

NOTES.

The Value of the Steam-Jacket.

The Research Committee of the Institution of Mechanical Engineers have issued a second report on the value of the steam-jacket. It has been printed separately, and contains tabulated results of experiments carried out by members of the Committee, of which Mr. Henry Davey is Chairman, since the publication of the first report in 1889. The details of five sets of original experiments constitute the bulk of this second report, to which Mr. Bryan Donkin, junr., of Bermondsey, has been an energetic contributor. The conclusion drawn by the Committee from these experiments is that the expenditure of a quantity of steam in an efficient jacket produces a saving of a larger quantity in the cylinder. The ratio between these two is an important element in this investigation. One experiment, conducted on a compound horizontal engine at the Royal Arsenal, Woolwich, by Lieut.-Col. English, Mr. Henry Davey, and Mr. Bryan Donkin, junr., appears to have given particularly favourable results, showing that, for every 1·13 lbs., of steam expended in the jackets, there was 5·82 lbs. less feed water passed through the cylinder; the net saving being thus 4·69 lbs. It also appears from the experiments that the smaller the cylinder, the greater in general is the percentage of gain from the use of the jacket, which doubtless arises from the fact that a small cylinder gives a larger jacket surface for a given weight of steam passing through it than is the case with a larger jacket.

Observations upon Structural Steel.

In the course of a discussion upon structural steel by the American Society of Civil Engineers, Mr. W. Metcalf, of the Crescent Steel Company, Pittsburgh, made some remarks on the condition of steel as it appears to the engineer. Mr. Metcalf stated, among other things, that a most important property of steel is that it always registers in its grain, as disclosed by fracture, the last highest temperature to which it has been subjected. This means that if a piece of steel is heated from the cold state to any colour which can be seen by the eye and is then cooled down, the resulting grain will be due to the highest temperature reached, modified, of course, by the mode of cooling and the treatment it has received while cooling. But for similar conditions of heating, cooling, and working while cooling, the final result will be the same always. If a fracture shows a uniform grain throughout, the mass has been subjected to uniform heat and working. If such grain is coarse and lustrous, of a yellowish tone, too high heat is indicated. If the grain is fine, lustreless, and steely blue or gray in colour, a proper heat has been used. If the grain is fine and black, or of a decided blackish tint, the metal has been worked too cold. If the grain is uneven, the piece has been heated or worked unevenly, or both. In such a case, injurious strains in the mass are inevitable, as it is shown that every variation of grain is accompanied by a change in specific gravity, which means variation of volume, and consequently hurtful internal strains in the mass. If the outside of the specimen is fine-grained, and the inside coarse and fiery, it shows high initial heat modified by superficial and insufficient working, either under the hammer or in the rolls. If the contrary indications appear, it shows that the last heat was too high, too quick, and too superficial. All these remarks point to the value of annealing in every case where there is reason to suspect unevenness of heating or working. If any piece of steel is heated uniformly to, or very little above, the temperature of recalescence (or, as a good practical guide, to medium orange colour), it will take the fine grain due to this colour; and if the heating is properly done, the grain will be uniform, and all internal strains will be reduced to insignificance or wholly eliminated. The critical, dangerous temperature at which no work should be done upon steel is, according to Mr. Metcalf, that of cherry red, or when redness just begins to appear upon heating, or to disappear upon cooling.

New Tests for Cement.

According to a paper read by Captain Maclay before the American Society of Civil Engineers, the most important quality in Portland cement is its constancy of volume, which should take precedence over the early tensile strength, because, no matter how strong a cement may be at first, if it shows any tendency to swell or change its volume, its ultimate failure by the disintegration of its constituents is only a question of time. For the determination of this quality of constancy of volume, there is nothing like the steam and hot water test. As now conducted by the Department of Docks of New York City, this test is as follows: Six parts of pure cement and water are moulded about ½ inch thick and 3 inches in diameter, on thin glass plates, and of the same consistency as briquettes. One of the pats is placed as soon as made in a steam-bath, of a temperature from 195° to 200° Fahr. The second pat is placed in the same steam-bath as soon as it is set hard. The third pat is placed in the bath after double the time taken for setting hard, counting from the moment of gauging. The fourth pat is put in after 24 hours. The fifth pat, as soon as it has set hard, is placed in fresh water at a temperature of about 60° Fahr. The sixth pat is kept in moist air at the same temperature. The first four pats are kept in the steam-bath for three hours, then immersed in water at 200° Fahr. for 21 hours, when they are taken out and examined. To pass this test perfectly, all four pats should show no swelling, cracks, or distortions, and should be adherent to the glass plates. The last condition, while it is satisfied by some cements nearly free from uncombined lime, is not insisted upon; the cracking, swelling, and distortion of the pats being by far the most important considerations. The cracking or swelling of the first pat alone can generally be disregarded; bad samples fail in all. Other tests are made with a mixture of cement and sand to corroborate the first, in cases where rejection is indicated.

TECHNICAL RECORD.

THE DIFFUSION OF LIGHT.

At the last Meeting of the Physical Society, Dr. W. E. SUMPNER read a paper on the above subject, of which the following abstract appeared in the *Chemical News*:—

The influence of diffusion in increasing the illumination of rooms and open spaces had not, in the author's opinion, been sufficiently appreciated. Being impressed with the great importance of the subject, he was led to make determinations with the coefficients of reflection, absorption, and transmission of diffusing surfaces. To give precision to terms sometimes vaguely used, several definitions were proposed. "Reflecting power" was defined as the ratio of the amount of light reflected from a surface to the total amount of light incident upon it; "illumination" of a surface, as the amount of incident light per unit of surface; "unit quantity" of light as the flux of radiation across the unit area of a sphere of unit radius, at the centre of which unit light is placed; and "brightness" as the candle power per unit area in the direction normal to the surface. Denoting these quantities by η, I, Q, and B respectively, and assuming the cosine law of diffusion (*i.e.*, the candle power in any direction is proportional to the cosine of the angle between the direction and the normal of the surface), it was shown that $\pi B = \eta I$, and that the average illumination (I) of the walls of a room is related to the illumination (I) due to the direct action of the lights as expressed by the formula—

$$I' = \frac{I}{1 - \eta}$$

If the reflecting power of the walls, &c., be 50 per cent., $\eta = 0{\cdot}5$, and $1' = 2\,I$; while if $\eta = 0{\cdot}8$ (a number approximately true for white surfaces), then $I' = 5\,I$. The illumination due to the walls may therefore be far more important than that due to the direct rays from the lights. When the surfaces consist of portions of different reflecting power, the average may be found from the equation—

$$\eta = \frac{\eta_1 A_1 + \eta_2 A_2 + \&c.}{A}$$

A being the total surface, and A_1, A_2, &c., the areas of surfaces whose reflecting powers are η_1, η_2, &c., respectively. This law is shown to be quite accurate for spherical enclosures.

In measuring reflecting power, the surface was attached to a large screen of black velvet placed perpendicular to a 3 metre photometer bench. Two lights were used—one a Methven 2-candle standard placed at the end of the bench remote from the reflecting surface; and the other, a glow lamp of about 20-candle power, was attached to a slider, which also carried a Lummer-Brodhun photometer. The glow lamp served to illuminate the reflecting surface; but the photometer was screened from its direct rays. The formulæ used in reducing the observations were worked out in the paper, and tables of results given.

Absorbing power was determined by measuring the candle power of a glow lamp—first when uncovered, and then when surrounded by a cylinder of the substance under test. It was found to be of great importance to distinguish between apparent and real absorption; for reflection from the surfaces of the cylinders increases the internal illumination. The true absorption coefficient (a) is given by—

$$a = (1 - \eta)\frac{k_0 - k_1}{k_0}$$

where η is the reflecting power, and k_1 and k_0 the candle powers with and without the envelope of material under test.

In determining transmitting power, the Methven standard and photometer were placed on one side of the surface, and the glow lamp on the other. Difficulties were experienced from the fact that some materials, such as tracing-paper, transmit part of the light directly (like transparent substances) and another part by diffusion, according to the cosine law. Methods for discriminating between the different parts were therefore devised, both in the reflection and transmission experiments, and consistent results subsequently obtained. Tables and curves showing the close agreement of calculated and observed values were included in the paper. An abstract of some of the tables of numbers is given below:—

Material	Percentage Reflecting Power. η.	Percentage Absorption. a.	Percentage Transmission. τ.	$\eta + a + \tau$.
Blotting-paper	82	13·8	9·2	105·0
Cartridge paper	80	12·2	11·2	103·2
Tracing-cloth	35	15·0	54·4	104·4
Tracing-paper	22	7·0	76·0	105·0

The reflecting power (η) of an ordinary mirror is given as 82 per cent.; ordinary foolscap, 50 to 70 per cent.; tissue paper (one thickness), 40 per cent.; do. (two thicknesses), 55 per cent.; yellow wall paper, 40 per cent.; blue paper, 25 per cent.; dark brown paper, 13 per cent.; yellow painted wall, 20 per cent.; black cloth, 12 per cent.; and black velvet, 0·4 per cent. The percentage absorption (a) of arc lamp globes is given as "apparent;" of light opal globes as 15; dense opal globes, 39; and ground glass, 42. Theoretically, the sum of the reflecting, absorbing, and transmitting powers should be unity; but from the foregoing figures, it will be noticed that they exceed 100 per cent. by amounts greater than can be accounted for by experimental error. This discrepancy the author thought might be attributed to the law of cosines not being exactly fulfilled.

In the discussion upon the paper, Mr. A. P. Trotter said he had been for many years interested in the subject of diffusion of light, with a view to obviating the glare of arc lamps. Some experiments he had made on reflecting power gave unsatisfactory results, owing, as he now saw, to his not taking into account the solid angles subtended by the reflecting surfaces. The reflecting power of substances was of great importance in the illumination of rooms; in one case, measured by Dr. Sumpner and himself, two-thirds of the total illumination was due to the walls. It would greatly simplify measurement of reflecting power if some substance could be adopted as a standard. Referring to the cosine law, he said he had found it true, except when the angles of incidence approached 90°. In cases where considerable total reflection took place, the apparent brightness near the normal direction was greatly in excess of that in other directions. These points he illustrated by polar curves. He had also considered what should be the nature of a roughened or grooved surface to give the cosine law of diffusion. No simple geometrical form of corrugations, &c., seemed to fulfil the required conditions. Dr. Hoffert said the high numbers given for the reflecting powers of substances were very interesting. Most people had noticed the effect of laying a white tablecloth in an ordinary room. He had also observed that wall papers of the same pattern, but slightly different in colour, had very varying effects in producing increased illumination; and he wished to know if the influence of small differences in colour and texture on diffusing power had been investigated. Mr. Addenbrooke said that the importance of the subject under discussion was impressed on him when he passed through America three years ago, and noticed the crude manner that electric lighting was there carried out. If using good reflecting surfaces increased the illumination of a room 50 per cent., it was like reducing the cost of electricity from 8d. to 4d. per unit. Dr. C. V. Burton did not understand why the cosine law should be objected to, for it was possible that no surface was perfectly diffusive. The effect of reflection from walls, &c.,—say, in illuminating a book—would not, he thought, be so great as would appear from the numbers given; for one usually read near a light, and the reflected light falling on the book was only a small part of the whole, on account of the greater distance of the walls. Another member pointed out that, in experiments such as those described in the paper, it was very important to screen the photometer and surfaces from all radiation other than that under test. He rather doubted whether any surface reflected as well as mirrors. White surfaces might appear to do so; but this was probably because the eye would over-estimate it, owing to the superiority of white in aiding distinct vision. Dr. Sumpner, in reply, said he had, as stated in the paper, used white blotting-paper as a standard of reflecting power, and found it very convenient. His most careful measurements had been made on whitish surfaces, and not on coloured ones. When one colour—say, red—preponderated in a room, the average light would be much redder than that emitted by the source, owing to the other colours being absorbed. In considering illumination as related to distinct vision, it was necessary to take account of the eye itself; for the pupil contracted in strong lights and opened in feeble ones. This subject he said he hoped to treat fully in a subsequent paper.

Mr. T. A. Guyatt has completed the engagement entered into by him with the Monte Video Gas Company three years ago; and, declining to renew it, he has returned to England.

Gas and Oil Motors for Tramway Traction.—At the meeting of the Tramways Institute of Great Britain and Ireland in Birmingham last Friday, the President (Mr. W. J. Carruthers-Wain), in the course of his opening address, referred to the subject of traction. He said that nothing very special had arisen in regard thereto during the year, except the further development of various ideas which had already been brought before the members. The gas-engine system, which came under notice at Bradford in 1891, had so far progressed that a Company was being formed to demonstrate the feasibility of employing it; while the Connolly oil-engine had obtained the approval of the Board of Trade, and was being tried on the Greenwich line. He expressed the hope that the members were not so sanguine as they were when they met in Birmingham six years ago to listen to the glorification of steam. He had always maintained a rigid impartiality with regard to the various methods of traction on tramways; and he had never pledged himself to the absolute success of a particular form in any place.

THE RECOVERY OF BYE-PRODUCTS FROM COKE-OVENS.

The November number of the *Journal of the Society of Chemical Industry* contains the text of a paper on the above subject read by Dr. C. Dreyfus before the Manchester Section of the Society; and we give below the principal portions.

The author began by calling attention to the gradual fall in the prices of tar products, and especially of benzene and anthracene, which has taken place in the past twelve or eighteen months. In January, 1891, the prices of benzene were: 90's, 4s. 8d.; 50's, 3s. 6d. At that date anthracene was selling at 1s. 4d. per unit; and sulphate of ammonia at £10 10s. per ton. On the 1st ult., the prices of benzene were: 90's, 1s. 6½d.; 50's, 1s. 3½d.; anthracene selling for 9d. per unit, and sulphate for £10 per ton. Most people in England had, he said, been at a loss to account for this shrinkage in values; and various causes had been assigned for it. One, however—viz., a larger production—had been overlooked. The real reason of the depression in the prices of both benzene and anthracene was the large yield of tar from the coke-ovens abroad, the production of large quantities of benzene from that tar, and more especially from the gas of the coke-ovens; and though England had, up to now, been the greatest producer and exporter of benzene and anthracene, he feared this would not be the case in the future, unless English coke-oven proprietors followed the example set to them by their colleagues abroad, and carbonized the whole or part of the 15,000,000 tons of coal which, according to Sir Lowthian Bell, are annually coked, for the use of iron-works, in ovens specially constructed for the recovery of tar, benzene, and ammonia.

Passing on to consider the historical part of his subject, Dr. Dreyfus, quoting from the second edition of Dr. Lunge's "Coal Tar and Ammonia," made a brief reference to the successful attempt of Stauf—the "Kohlenphilosoph," as he was called—to recover the tar formed in the coking of coal. The iron-masters, engineers, and chemists all over the world had, he said, given much time and great attention to the question of the progress of coke-ovens, having special regard to obtaining bye-products. Their experimental work extended back some 35 years. Again quoting Lunge, he said that Appolt, Semet, Coppée, and others, had constructed ovens which had been for 30 years in general use in Germany, Belgium, and France; while in Great Britain nothing seemed to shake the belief of iron-smelters in the infallibility of the beehive ovens. But it was thought, even on the Continent, that any attempt at condensing tar and ammonia must necessarily be fatal to the quality of the coke; and it was only quite recently that this belief had been thoroughly shaken. Dr. Dreyfus said he could add his testimony to that of Dr. Lunge, that the coke made in the ovens where bye-products are recovered is now declared to be equal in quality to the coke from beehive ovens. The French first, and the Germans afterwards, took up this question; and it had made slow but sure progress. He then proceeded to point out that the plant for the recovery of tar, benzene, and sulphate of ammonia is not simple, and requires the greatest attention; and the fear was entertained that, by the introduction of these methods, the coal-owners would be compelled to add chemical works to their mines. Moreover, it increases considerably the primary cost of the coke-ovens. Reference was made to the praiseworthy efforts of Mr. Hüssener and Dr. Otto in the direction of making clearer the advisability of recovering the bye-products; 1205 Hoffmann-Otto ovens being now at work, as compared with only 40 in 1884. One of these ovens can be charged with 6¼ tons of coal; and it requires 48 hours to work off. A ton of dry coal yields, on an average, 14¼ cwt. of coke, 10 gallons of tar, and 25 lbs. of sulphate of ammonia. It is reckoned that every 100 cubic metres of the surplus gas produced replaces 87·5 kilos. (about 1¾ cwt.) of coal in the heating of boilers.

Dr. Dreyfus next dealt with the Semet-Solvay coke-ovens, which are in use in Belgium, France, and Germany, but in only one works in England. The principal installation of these ovens is at the Havré Colliery, near Mons, where 100 are in operation. Each oven takes a charge of 4 tons of coal; and the coking is effected in 22 hours. Coal containing from 16 to 17 per cent. of volatile matter yields an average of 81 per cent. of coke, exclusive of breeze. Its quality is absolutely the same as that of coke produced in ovens of the ordinary type; but the residual products vary in quantity according to the nature of the coal. At Havré it is poor; and the average yields are 13½ lbs. of sulphate and 31 lbs. of tar per ton. At the works of Messrs. Brunner, Mond, and Co., of Northwich, according to figures furnished to Dr. Dreyfus by the Managing-Director (Mr. G. Jarmay), the average yield of sulphate for the past half year was 27 lbs., and of tar 88 lbs. per ton of coal. He explained, however, that the ovens are of the oldest type, and that it is intended to replace them by improved ones, which he quite expects will result in an improved yield of both residuals.

The author then proceeded to consider the subject of the extraction of benzene from the gas of coke-ovens. His remarks thereon, and the remainder of the paper, we reproduce in full, as follows: It is now about three years ago that, besides tar and ammonia, benzol was directly recovered from the gas of these ovens. The plant for this process has been devised by

Mr. Frank Brunk, of Dortmund. The process is kept a secret; but my friend Mr. G. E. Davis, and others who studied this question years ago, will know probably what that secret consists of. So much, however, is known that between 3 and 7 kilos. (7 to 16 lbs.) of 90 per cent. benzene are recovered from the gas of one ton of coal coked. The quantity varies, of course, according to the nature of the coal. These figures offer nothing abnormal when it is known that 12½ kilos. (27½ lbs.) of 90's benzene can easily be obtained from the gas of a ton of good coal, distilled in an ordinary gas-retort.

It is stated that the cost of erecting the benzene recovery plant is £250 per oven (the Brunk system). Taking the present coke-ovens as 1205 (I have been informed there are now 1350 Hoffmann-Otto ovens at work in Germany only, and that more are in course of construction), the quantity of coal they can coke per annum is 1,382,400 tons. Assuming only the minimum of 3 kilos. of benzene per ton of coal, the yield in benzene, from the gas alone, would be 4,147,200 kilos., or upwards of 1,000,000 gallons. I do not think there is as yet quite so much as this quantity produced in Germany from coke-ovens—all the ovens not being arranged to recover the benzene from the gas; but I believe, if we take Belgium and Germany together, there is not less than 1,000,000 gallons of benzene, and principally 90's quality, produced at present from coke-ovens alone. There is no doubt that this production of bye-products is on the increase, because the Semet-Solvay system of ovens can be put down at a moderate figure, including the recovery of all bye-products —tar, ammonia, and the extraction of the benzene from the gas. The cost of an oven, including all, would be about £260; the bye-products, after deducting supplementary costs, yield £72 per annum as net profit (this does not include the extra profit from the extraction of the benzene from the gas).

The recovery of bye-products is not only of importance to the tar and colour industries, but it is of enormous value to agriculture. If we take into consideration the great profits realized in this industry (notwithstanding the lower prices now ruling), which on tar and ammonia alone are upwards of 40 per cent. on the cost of the plant, as I shall show later on, and if we add to this the profits on the benzene from the gas, we come to the conclusion that this recovery of bye-products from coke-ovens must go on increasingly. The demand for sulphate of ammonia and for tar is such that all the coke-ovens in Germany, and even in England, if they were to recover their products, would find a ready sale for them. The actual daily consumption of pitch in Westphalia alone is 150 tons, which would take the tar of 3000 ovens.

Sulphate of ammonia is a valuable manure. In Germany the consumption of nitrogen-containing manures has been as follows:—

	1887. Tons.	1888. Tons.	1889. Tons.	1890. Tons.
Sulphate of ammonia	33,865	35,564	33,555	33,788
Nitrate of soda . .	194,610	259,482	320,820	330,366
Guano	71,880	58,261	54,062	46,144

If all the nitrogen in the above manures could be replaced by sulphate of ammonia, it would mean that 285,000 tons of sulphate would be required. The total quantity of sulphate produced from coke-ovens per annum up till now is only 17,500 tons; and if all the existing ovens in Germany were to recover their bye-products, the total annual production of sulphate would only be 120,000 tons. If we take the price of tar at 10s. per ton, and that of sulphate of ammonia at 10s. per cwt., the yearly gross income from one "Otto" oven would be £102, £145, or £165, according to its location in the Saar, Ruhr, or Upper Silesian district. From these figures have to be deducted the general expenses and the sulphuric acid used for sulphate making, which are estimated at £50 per oven; leaving, therefore, a net profit of upwards of £100 for bye-products per oven, not including benzene.

In Germany barely 10 per cent. of the coke-ovens in use are fitted up for the recovery of bye-products. It is estimated that the production of coke in Germany in 1891 was 7,700,000 tons. If the whole of this coke had been produced in ovens fitted up for the recovery of products, it is estimated that the net profit from tar and ammonia alone (without taking into account either the benzene or the extra gas useful for other heating purposes) would be £1,440,000. I would put the matter in a different way to prove how profitable this industry would be to this country. The best coke-ovens, without recovery of products, yield 60 tons of coke per month, according to information which I consider reliable. Supposing the construction of such an oven costs £80, the capital required for putting up ordinary ovens, producing 100 tons of coke per month, would be, without recovery of products, £133 6s. 5d. for the Semet-Solvay oven; with recovery, the cost is £260 for 100 tons coke produced per month, or £126 13s. 7d. more capital is expended. These 100 tons of coke would yield in products, after deducting supplementary cost, £6 per month, or £72 per annum, which is 57 per cent. of the additional capital spent for the same production. If to this we were to add the extra available gas, of which one-half is sufficient for heating the ovens, and the benzene contained in the gas, which can be extracted at very small cost, then the figures would come out still more favourably. These figures apply to the poor coal used at Havré. In England, where better coal is available, improved results would be obtainable. Here, the yield per ton would be 27 lbs. of sulphate and 88 lbs. of tar; in Belgium, it would be 13½ lbs. and 31 lbs. only. The available gas would also be larger in England than in Belgium; one coal being so much richer in volatile matter. Let us suppose that the 15,000,000 tons of coal which are coked per annum in England were treated in ovens of the Semet-Solvay type for the recovery of the bye-products, we should obtain of sulphate of ammonia 180,000 tons, and of tar 130,000,000 gallons. We should have surplus gas available equivalent to one-fifth of the total coal consumed, and benzene from the gas in such quantity that I fear to mention the figure.

The Board of Trade returns as to gas undertakings for 1890 give the quantity of coal used for gas making as 10,242,317 tons. This applies to authorized companies; but as there are still a large number of others, it is probable that the above total would reach 11,000,000 tons. If, instead of the present system of working, gas were produced for sale by Semet-Solvay ovens, the coke could be used for metallurgical purposes, and the gas could be produced much cheaper than at present. If, finally, all the coal used in factories, works, and houses for heating purposes, and for the production of power, were coked, the gas and the coke produced would be available for heating and lighting purposes; we should do away with fogs and smoky towns; and the cost would be less than at present. I throw out these suggestions, and they merit the consideration of all thinking men, whether politicians, sanitarians, engineers, chemists, or manufacturers. If we in England, using annually such an enormous amount of coal, were to recover the bye-products, our profits would be large, our agriculture and industry would greatly benefit by the progress, and our towns would have a bright and clear atmosphere, where it would be a pleasure to live; and I hope the time will come when this progress which I foresee will be an accomplished fact.

THE VYRNWY WATER-WORKS.

At a recent Meeting of the Liverpool Engineering Society, Mr. G. F. Deacon, M.Inst.C.E., read a paper on the subject of the Vyrnwy Water-Works of the Liverpool Corporation, which were carried out under his supervision, and brought to a successful completion in July last.

At the outset of his remarks, Mr. Deacon stated that he proposed, except where the details of the engineering features of the Vyrnwy works were of a kind not common to others, to consider only their broad features, and the principles of their construction as affected by the position of Lake Vyrnwy among the mountains of North Wales, and that of Liverpool on the northern side of the Mersey estuary. He then proceeded to give details of the lake basins and the construction of the Vyrnwy dam. He said that the latter was remarkable as the first high dam in which a bye-wash had been avoided by permitting the whole of the surplus water to flow over the sill and down the apron to the river below. Having investigated the subject on the Continent, he was led to believe that the reluctance to adopt this method had arisen from a fear—probably not on the part of the engineers themselves—that serious wear of the apron would result. This fallacy was, no doubt, due to the incorrect interpretation of the phenomenon of wear in rocky rivers by gravel and sand propelled by water, and in stone mill-dams. Of serious mechanical wear, either of rock or iron, by water alone, the author said he had not found any evidence. One manifest advantage of utilizing the sill of the dam as an overflow, was the great width it generally afforded. It was desirable to construct the apron of such form that the water discharged over the sill would be directed horizontally at the level of the river below the dam. Hence the bench, projecting like a horn, at the back of the masonry, some 45 feet above the rock foundation. As it was clear that no portion of the dam was weaker to resist the water pressure than its junction with the rock foundation, it was sufficient to investigate the resistance of this level. A few of the more interesting facts, relating to the conditions of equilibrium of a vertical section of the dam 1 foot thick, resting upon the deepest part of the foundation rock, were given, as follows: (1) Although the backwater is 45 feet deep, the amount by which it reduces the overturning moment of the lake water was only 4¼ per cent. In other words, the dam required practically the same section as if its foundations were level with the back-water, instead of being 45 feet below. (2) The stability was slightly greater when the reservoir was full than when it was empty. The additional pressure required to crush the inner toe of the masonry when the reservoir was empty was somewhat greater than the additional pressure required to crush the outer toe when the reservoir was full. (3) The maximum compressive stress within the masonry or foundation was near the inner toe. It occurred when the reservoir was empty, and might approach a pressure of 9 tons per square foot. (4) The maximum compressive stress within the masonry or foundation with the reservoir full was near the outer toe, and might approach a pressure of 7·63 tons per square foot. At no part of the masonry could the stress exceed these intensities. In 1885, 15 blocks of stone and concrete were carefully quarried from different parts of the interior of the masonry, and were tested by Messrs. D. Kirkaldy and Son. The average compressive stress under which these showed the first sign of failure was 263 tons per square foot. The average stress under which they gave way was 294 tons per square foot. The minimum stress at which any block showed

the first sign of failure was 181·4 tons per square foot; and the stress at which the same block gave way was 198·7 tons. Eleven blocks of the rock used for the masonry and materials of the concrete were tested under compression by Professor Unwin. They gave a mean ultimate strength of 823·4 tons, and a minimum strength of 733·4 tons per square foot. In addition to these, a number of 9-inch cubes of concrete made during the progress of the works were tested with much the same results by Professor Unwin and Messrs. Kirkaldy and Son.

Nearly all the concrete tests exhibited a remarkable and important feature. The fractures took place in the manner usual with brittle materials, by shearing of the material in such directions as to leave a pyramid standing; but this shearing very generally occurred through the solid stones, large and small, and did not follow the cement mortar joints. No better proof than this of the excellence of the materials and their manipulation could be afforded. By using a large proportion of ground rock instead of river sand, the cement mortar was rendered almost as plastic as lime mortar; the water tightness became entirely satisfactory, and the strength was not reduced. The rock used was clay slate, with nearly the same composition as the river sand.

The strength of the composition of the mortar was in every case greater where the briquettes were kept under a damp cloth for the whole period of 12 days and 12 weeks respectively before being tested, than where they were kept under the damp cloth for only 18 hours, and immersed in water for the rest of the period. In the limestone district, the unwashed sea sand made a mortar of almost precisely the same strength as the washed river sand; and each gave a higher strength than the river sand unwashed. In both districts the washed river sand was inferior to the ground rock. In the Silurian district, the ground rock and river sand in equal proportions gave about the same strength as the ground rock. In relation to the strength of the pure cement, the strengths of all the compounds were remarkably high. Thus, while the proportion of cement was reduced to 14·3 per cent., the strength of the Silurian district crushed rock briquettes kept under the damp cloth, and tested after 12 weeks, was only reduced to 43 per cent., and that of the immersed briquettes only to 28·5 per cent. (which latter figure was shown by other tests to increase after a longer period more rapidly than the percentage of the damp cloth briquettes); while in the case of the crushed limestone 6 to 1 mortar, they had the still more remarkable fact that 48 and 40 per cent. respectively of the strength of the pure cement was preserved. In quantities of sand and cement ranging from 2 to 1 up to 6 to 1, the proportion of the strength of the pure cement retained was about twice that of cement to the aggregate. This, so far as the author was aware, was the highest result yet attained, except with crushed limestone. The rate of improvement in the manufacture of Portland cement, as well as the better knowledge of making mortar, might be judged from the fact that, 27 years ago, Mr. Grant, using Thames sand in the proportion of 5 parts to 1 part of Portland cement, obtained, after 52 weeks, less than one-fourth the strength of Vyrnwy mortar made in the same proportions, and tested at the end of only 12 weeks. The increased plasticity of this mortar was explained by the fact that the finer portions of the crushed stone and the cement contained in the aggregate sufficed to form a complete envelope around each coarser particle, in which, during manipulation, the coarser particles readily rolled or slid, and which, filling all interstices, rendered them water-tight. To this, and to great attention to perfect consolidation by punning, the remarkable water-tightness of the Vyrnwy masonry and concrete was attributable.

Reverting to the general account of the work, the author said the dam impounded the waters of the Vyrnwy to a maximum depth, in ordinary weather, of 84 feet. The capacity of the lake was 12,131,000,000 gallons from the level of the sill of the dam, about 825 feet above the sea, to the lowest level at which 40,000,000 gallons a day might be drawn for Liverpool. The length of the lake was 4¾ miles; and its width, from one-fourth to five-eighths of a mile. The area naturally draining into it was 18,000 acres; but the Liverpool Corporation Water-Works Act, 1880, empowered the Corporation to take the water from two other streams—the Avon Conway and Marchnant, which, when connected by tunnels with the lake, would increase the available drainage area to more than 22,000 acres. The compensation water to be given to the river was 10,000,000 gallons a day; and on 32 days during the eight months from March to October, this volume was increased to 50,000,000 gallons a day—bringing up the total average to rather more than 13,500,000 gallons a day. In regard to the purification of the water, about which there has recently been so much discussion, Mr. Deacon remarked that, in order to avoid the flood waters of the River Cynon, the Vyrnwy tower, containing the intake, had been placed in deep water off a promontory between the Rivers Cedig and Cynon. There, even in high flood, the water was comparatively undisturbed by undercurrents; and the maximum advantage was probably derived from the natural agencies by which all lake waters were purified. The purest water being near the surface, it was collected there, whatever might be its level at the time, by means of valves on a very simple principle, which were not subject to wear, and upon which the pressure of the water was balanced. It might almost be said that in Lake Vyrnwy there were no impurities of animal origin; and, except peat, there were none whatever, either of animal or vegetable origin, of the slightest importance. The proportion of peat was small, and was only material in so far as it affected the colour of the water, which had wonderfully improved since the lake was first filled. But, like all surface waters, the lake contained inert suspended matter and hardly visible organisms. In some way these, with the fish life, ought to be prevented from reaching the filter-beds at Oswestry.

With regard to the conveyance of the water to Liverpool, Mr. Deacon remarked that the first 18 miles passed over mountainous country; the hills being tunnelled where necessary. From Oswestry, for about twenty miles, the line was kept as near as possible—without undue increase of length—to the comparatively high land near the watershed between the Severn and the Dee. It then crossed the Rivers Weaver and Mersey, and terminated at the Prescot reservoir, nine miles from Liverpool. When finished, the aqueduct would at most places be triple—each line being capable of conveying to Liverpool more than 14,000,000 gallons of water a day. The first line was now in use; and some of the more important works had been completed for all three instalments of water. Crossing the line of aqueduct—besides the Mersey and other natural rivers and the Weaver Navigation—there were five canals and twelve railways. The last link in the Vyrnwy aqueduct was now reached—the only work involving very serious difficulty and danger in the undertaking. Mr. Deacon said the construction of an aqueduct tunnel under the River Mersey was not entered upon in a foolhardy manner, though, if the advisers of the Corporation had deliberately proposed a tunnel in such a position, they would have been open to the charge of foolhardiness. On the contrary, they advised against it. They had chosen the softest and best place for the pipes to lie in just below the river bed; and this, as it happened, was one of the very worst places for a tunnel. In this position the pipes could have been laid without the smallest injury to navigation, present or future; but an unfortunate Board of Trade decision compelled the Corporation to place them so far from the surface that tunnelling became a necessity. As finally carried out, this tunnel was unique in respect of the combination of its depth below the river with the nature of the material passed through. The material was heterogeneous in the last degree; and it was all—except certain lenticular masses of clay—perfectly loose, and charged with water under the full tidal pressure. Open gravel, coarse sand, silt, and clay frequently occurred—three at a time—in a single face; and, to make matters worse, a few ancient but well-preserved trunks of oak lay in the line of the work. Mr. Deacon minutely described the difficulties encountered in the construction of the tunnel, the attempts made by the several contractors to carry out the work, and his final completion of the undertaking.

Mr. Deacon's remarks were illustrated by numerous diagrams and sections of the works described in his paper.

The Thames Conservancy.—The Conservators of the River Thames have made their estimates of the receipts and expenses in connection with the upper navigation of the river for the present year. The receipts are set down at £23,750, of which a sum of £16,550 is contributed by the London Water Companies. The expenses are estimated at £17,068. In the event of the Conservators being compelled to appear before Committees of Parliament or the Royal Commission on Water Supply, additional expenditure may be incurred in law and parliamentary expenses.

Companies Wound Up in the Past Year.—Among the joint-stock undertakings wound up voluntarily in the past year were the following: Albo-Carbon Light Company, Ashford Water-Works Company, Eclipse Electric Lighting Syndicate, Gas Oil Syndicate, Holmes's Lights Company, Newark-upon-Trent Water Company, Oxygen Light Company, Penn Lamp and Lighting Company, Robert Dempster and Sons, Spence's Metal Manufacturing Company, South Staffordshire Electric Lighting Company, Water-Works and Gas-Works Securities Corporation. Among the companies wound up by order of the Court were the Lucigen Light Company, the Pamplona Water-Works Company, and the Wanzer and Defries Patent Safety Lamp Manufacturing Company.

Vegetable Growth in Water-Mains.—A vegetable growth in the water-mains at St. Paul (Min.) has lately, according to the *Engineering Record*, been the cause of some trouble. The first case was discovered by the Superintendent, in one of two service-pipes in a single trench supplying a double house. A complaint was made of bad water, which flushing failed to improve. One of the pipes delivered pure water, and one supplied a muddy liquid that was of no use. This fact led to the conclusion that one of the services was foul; and the remedy applied on this supposition proved effective. The boiler of a portable engine was connected with the faucet of the kitchen sink from which the muddy water came, and a steam pressure of 70 lbs. forced against the 35 lbs. water pressure for 30 minutes—thereby driving the water out of the pipe. Since that time the pipe has always delivered clear water, and twelve similar cases have been successfully treated in the same manner. Great care has to be taken that there are no leaks in the service-pipes, and that none of the fittings are open during the steaming process.

REGISTER OF PATENTS.

Gas-Governors and Means for Varying their Load and Pressure.—Cowan, W., of Edinburgh. No. 22,737; Dec. 30, 1891.

Alluding to the object of his invention, the patentee says: "It has been proposed and attempted to make gas-governors capable of loading and unloading themselves, and so, in proportion to the demands of a district, to vary the pressure they give. In applying such a system, the plan has been tried of causing the bell, as it falls in response to an increased demand for gas, to begin at a certain point in its descent to take on gradually and automatically a load of water or other liquid, and to go on accumulating the same during the rest of its downward movement. The extra load and pressure thus received would, if in excess of the demand of the time, cause the bell to rise; and in so doing, it would gradually lose the extra load it had taken on. In this way, the pressure has been raised above, and then restored to, the minimum, in consequence of the falling and rising of the bell. To such an application of the principle of self-loading, there is the fundamental objection that it unnecessarily and undesirably interferes with the degree of pressure which may be sufficient at the time. After the valve has opened to the point at which the self-loading begins, an increase in the number of lights anywhere in the district produces an increase in the pressure everywhere. A demand which might be met by a mere increase of volume, is supplied at an increased pressure; and this increase of pressure may be entirely unnecessary. The area of the valve opening cannot be enlarged without the pressure being at the same time augmented. In like manner, a decrease in the demand, which would be most properly met by a diminished volume, is also attended by a decrease of pressure; and the combined effect of the two (one being unnecessary) may lead to a too sudden reversal of the bell's movement, and therefore to a sudden increase of both pressure and volume. Thus, a sort of see-saw action may be set up, because a varying demand has been met in an undesirable way. So far as the consumers are concerned, the above results might be avoided, or at least lessened, by each consumer or each group of consumers being provided with a governor, which, whilst varying the volume to suit the demand, would maintain undisturbed the required pressure against those changes in the density of the gas supply which the inadequate size of the mains render imperative. But the remedy here suggested might not in every case be practicable; nor would it be always convenient to carry it out." It is the object of the present invention to provide means and arrangements whereby the self-loading principle may be "usefully applied, and in such ways that no unnecessary or undesirable interference with the gas-pressure need take place."

Fig. 1.

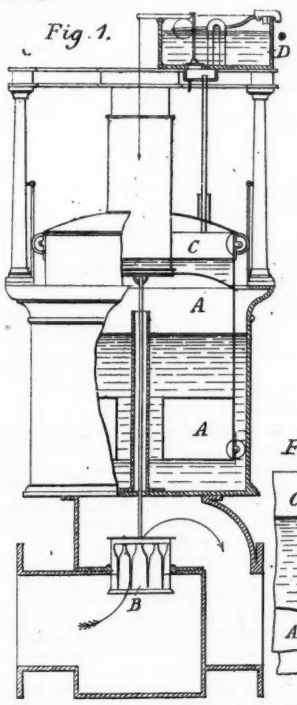


Fig. 2.

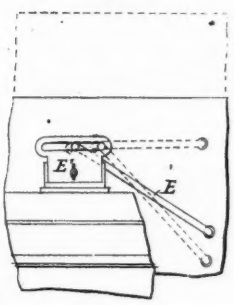


Fig. 3.

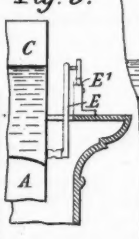
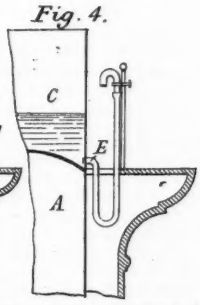


Fig. 4.



In carrying out the invention, the self-loading of the governor is deferred till the bell A has nearly reached the position in which the valve B is fully open, and therefore equal to passing the largest quantity of gas of which its area is capable. For the purpose of loading the bell (which is provided with a tank C of the usual kind), a water-cistern D is employed, provided with a ball-cock, or other means of regulating the quantity of liquid, and a syphon, or a valve (operated in the manner common to flushing-cisterns), to effect the discharge of the contents—water or any other suitable liquid. There is a pull-cord, chain, or other means to open the valve or start the syphon, as is usual in flushing-cisterns. As it is desirable that the amount of pull necessary should be the shortest possible, a pivoted lever, provided at its one end with a one-way acting-piece, is so arranged as to produce the necessary effect by a very small pull, applied by connecting the cord or chain to the governor-bell A in such a way that, just as the bell is approaching the end of its downward movement, the pull is given and the contents of the cistern D discharged. The loading-tank C of the bell must be below the cistern outlet-pipe; and it may be desirable that it should enter into a funnel or other convenient receiver mounted on the top of the tank, so as to lead the water as it issues from the cistern directly into the loading-tank C.

In some cases, the cistern may be pivoted on a frame or support; the pivoting being in such a position that the top or mouth of the cistern will be upwards when the cistern is empty, and will remain in that position till the water from the ball-cock attains a given height, at which point the cistern will tend to tip over and discharge its contents, and would do so but for the interposition of a retaining catch or lever arrangement. The support given by the retaining catch of this arrangement is withdrawn by the pulling of a cord, chain, or other suitable means, as already described; and when this occurs, the contents are discharged into the loading-tank of the governor-bell.

Whichever form of cistern or of pull is employed, the principle of the invention is the same—viz., that of discharging a given quantity of liquid into the loading-tank of the governor-bell on each occasion that the bell is nearly in its lowest position and the valve almost full open. The quantity of water which will at any time load the bell will be the total contents of the cistern; and this water will be discharged as speedily as may be desired, and the discharge will be independent of any movement on the part of the bell, except the very slight one which is required to initiate the flow. In this way, the extra loading of the bell cannot take place till the valve is passing nearly all the gas it can give at the existing pressure. When, however, this point has been attained, the extra loading will be immediate and complete; and its amount will be limited only by the contents of the cistern from which it issues. The load thus put on may in some cases produce a pressure greater than the demand at the time requires; and when this is the case, or becomes so subsequently, the bell will rise in the usual way, and reduce the valve-opening to suit the demand. Thus, a considerable or continuous rise of the bell and a corresponding reduction of the valve-opening ensues. But the pressure would remain the same; and this with a reduced demand would be undesirable. Means are provided therefore for the reduction of the extra load, so that the bell, on rising under the circumstances described, may have its load reduced either gradually or quickly during the whole rise; or else may be retained either wholly or partially until suddenly parted with, when a certain desired rise of the bell has taken place.

When the object is to allow the water to leave the loading-tank of the bell gradually, and in proportion to the rise, a mechanically jointed or otherwise flexible tube arrangement E is employed—shown in figs. 2 and 3—one end of which is fixed in connection with the lowest part of the loading-tank, by means of an india-rubber or other sleeve, so as to leave the tubular part beyond the joint free to move within the limits of an adjustable guiding arrangement E^1, which causes the tube to lie either in an angled or horizontal position as the bell rises and falls. When the bell is at its lowest point, and is receiving, or has received, the water from the cistern, the jointed tube attains such an angle that none of the water can escape till the angle is altered as the bell rises. It is entirely a matter of arrangement how early during the bell's rise the angle of the tube will be so altered as to enable the water from the loading-tank C to escape from the outlet end.

As a modification of the arrangement (as shown in fig. 4), the tube E may be formed as flexible, and provided at its top end with a small bent piece, which may be retained in any desired position by means of the support and screw, so as to obtain the same result as described with reference to figs. 2 and 3.

It is assumed and intended that the governor-bell shall be permanently loaded sufficiently to give a minimum pressure; for this is necessary before the self-loading arrangements can come into action.

Charging Gas-Retorts.—Ruscoe, J., of Hyde. No. 864; Jan. 15, 1892.

This invention relates to apparatus in which a revolving or rotating scoop is employed to charge the retort with coal; and it is designed with the object of giving an even distribution of the coal over the bottom of the retort, by employing two scoops to receive the charge of coal, and which are caused to rotate in opposite directions by suitable carrying and actuating mechanism.

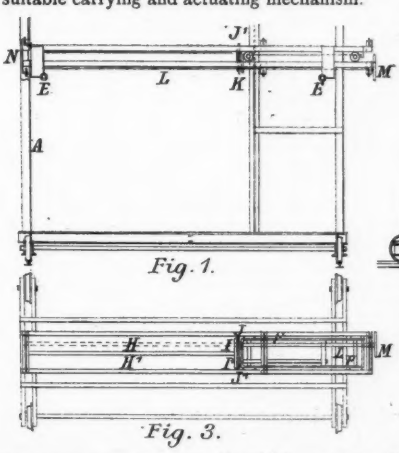


Fig. 1.

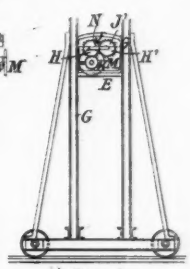


Fig. 2.

Fig. 3.

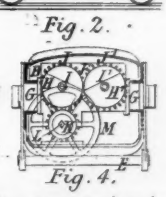


Fig. 4.

The frame or swinging cradle which supports the scoop-carriage is constructed of the longitudinal rails, braced together by the stays passing over the top and bottom and the side-stays. These side-stays also carry loops, to which the suspending cords are attached, and journals for the cross-shafts E, which carry chain-pulleys for drawing the scoops into and out of the retorts. The scoop-carriage is very similar to that described in previous patents of the same inventor;* consisting of a rectangular frame F, with a cross-brace, and mounted on runners G. In the scoop-carriage, two scoops H H^1 are placed side by side longitudinally; and each is capable of rotating on its axis. The bearings on which the scoops rotate are carried by the scoop-carriage; and the scoops are each attached to a rotating-disc I I^1, or other head—the connection being sufficiently rigid to

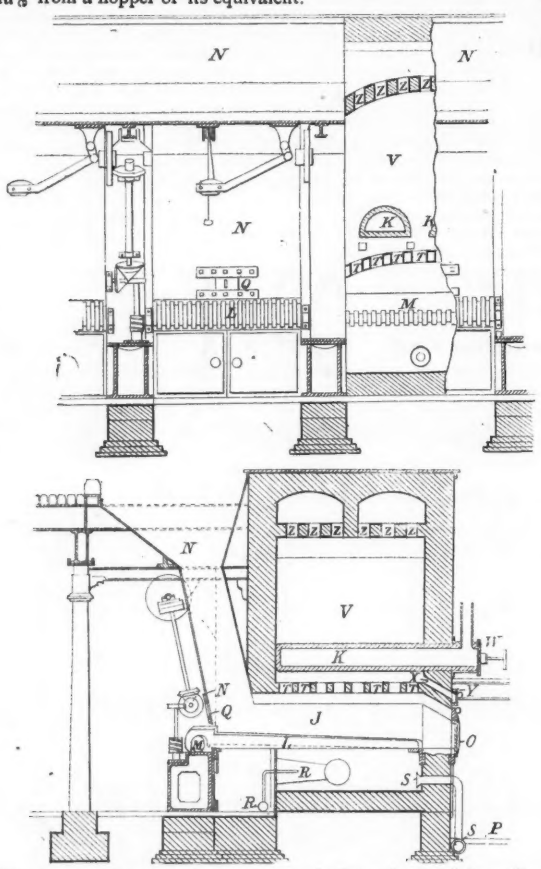
* No. 18,108 of 1889, No. 14,720 of 1890, and No. 8479 of 1891.

sustain the weight of the scoops when charged. These discs or heads are connected to, and supported by, shafts journalled in bearings in the front of the rectangular and cross-brace of the scoop-carriage; and they are geared together by wheels J J^1 on the shafts, so as to rotate simultaneously, but preferably in opposite directions. The scoops are rotated about their axes by a pinion K, which gears with the wheel J. This pinion is supported by a bracket on the front of the scoop-carriage; and it slides with the carriage to-and-fro on shaft L, which runs the entire length of the scoop-frame, and is supported in bearings at its ends. The shaft L may be rectangular, or fitted with a slot and key, so that the pinion turns with it and slides to-and-fro thereon as the carriage and scoops are moved backwards and forwards. It is turned by a hand-wheel M, or other suitable gear placed at the end. The two scoops are preferably connected together at their free ends by a link N attached to a central stud or bolt.

The scoops are made of a capacity to each hold about half the charge; so that the two together contain the full charge required for the retort. They are arranged preferably to rotate towards the sides of the retort; and thus an even distribution of the charge of coal is effected. To enable some of the coal to be deposited first over the centre of the retort bottom, one or both of the scoops may be mounted upon cranks or eccentric bearings, or be otherwise connected together, so that, when they begin to rotate, they will be carried asunder, and any loose or superimposed coal will be allowed to fall between them on to the centre of the retort, and the remainder of the charge be deposited when the scoops are turned over. Or the two scoops may be given first a movement inwards to deposit the superimposed coal at the centre, and then turned outwards to deposit the remainder of the coal. The position of the scoops when receiving the charge of coal and when entering the retort, is preferably that shown in fig. 4—the two edges close together.

Combined Refuse Furnace and Gas Manufacturing Apparatus.—Lomax, W. J. and C. J., of Bolton. No. 1181; Jan. 21, 1892.

This invention relates to apparatus employed for making gas from either coal, sewage sludge, excreta, or other material of a gaseous nature; and it has for its main object the disposal of town refuse, by constructing a furnace under the ordinary retorts employed in gas manufacturing apparatus, with means for charging the same with town refuse from a hopper or its equivalent.



The furnace J is under the retorts K; the latter being of the ordinary description employed in the manufacture of illuminating gas. The furnace consists of the moveable fire-bars L, which are operated backwards and forwards by the cams M and driving-gear from any convenient source. Immediately above, and at the driving end of, the fire-bars is the hopper N, of such a form as to allow of town refuse being tipped therein by means of a cart or other vehicle, or fed by hand, or mechanically by an ordinary bucket or other elevator or creeper. The bottom end of the hopper is the full width of the furnace, to ensure of the refuse to be treated being delivered over its entire width. The fire-bars being moveable, and on the self-carrying principle, the refuse deposited thereon from the hopper is automatically carried the full length of the furnace, during which it is reduced to a friable state, and delivered by the movements of the fire-bars through the hinged door O to the floor P at the back end of the furnace. The hopper front is provided with an opening Q, to allow of the refuse being stirred up or pushed forward on the bars by a rake or its equivalent.

In order to facilitate or increase the burning power of the furnace, and provide heat sufficiently high to consume any kind of town refuse, a steam-jet blast R is disposed under the fire-bars; and to further increase the efficiency of the furnace, an air-blast S is provided—being supplied from an ordinary fan, blower, or an air-current caused by a jet of steam.

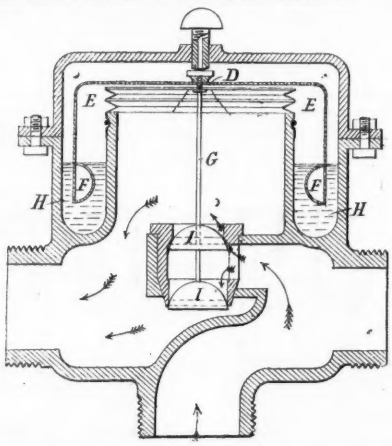
The upper side of the furnace is formed with openings T to allow of the heat and gases given off from the burning refuse being transferred into the retort chamber V, where the gases will be consumed and the heat utilized for maintaining or supplementing the temperature of the retorts employed for manufacturing gas from either coal, cannel, sewage sludge, excreta, or other materials of a gaseous nature. The charging of the retorts is effected in the usual manner, by removing the lids W. If desired, a supplementary air supply X may be provided, regulated by the door or cover Y. Smoke and unconsumed gasses pass from the retort chamber V through the openings Z to the flues leading to the chimney-stack.

Water-Jackets for Gas-Engines.—Brooks, J. B., and Holt, J., of Birmingham. No. 1246; Jan. 22, 1892.

This invention relates to a system of water circulation, in connection with the water-jackets of gas-engines, so as to keep the cylinders cool, and prevent undue heating during working. It consists primarily in employing a mechanical circulator or artificial circulator in connection with the water-jackets. The jacket is made to surround the cylinder, with inlet and outlet pipes—the former connected with the under side or bottom part of the jacket, and the other directed from, or at the top of, it. These pipes are in communication with a cooling-tank, through which the water employed as the circulating medium for keeping the cylinder of the engine cool, actively passes. The return pipes are provided with a centrifugal or other pump, helix, Archimedian screw, vane, or the like, the rotation of which forces the water before it—preferably disposed at an elevation relative to the supply or feed pipe—so that the water of the system returns to a given level, by gravitation, and so keeps the cylinder cool by the circulation and cooling of the water in circuit.

Gas Regulators or Governors.—Love, J., of Barking. No. 1320; Jan. 22, 1892.

This invention has for its object to provide a reliable and efficient gas-governor of the class in which the regulation is effected through the medium of a small gasholder or bell, which floats upon mercury or other suitable fluid contained in an annular chamber.



The gas-governors of this kind as hitherto constructed, says the patentee, are unreliable, for the reason that in some instances the pressure of gas is sufficient to displace the mercury more or less, and thus render the governor inoperative, or cause an escape of the gas through the vent usually provided at the top of the casing. To obviate this defect, it is proposed to employ a flexible diaphragm or cover D of skin, oiled silk, or other suitable material between the gas chamber of the governor and the gas bell. This diaphragm or cover is fitted over, and firmly secured to, the inner or gas chamber of the governor by a wire in an annular groove; and by its means the entrance of gas into the annular chamber H for the mercury is prevented, while the gas ascending in the inner chamber from the main will impinge against the diaphragm, and thus raise the float F and bell E to operate the controlling-valve I as required.

Another feature of the invention is the provision of an air chamber or float chamber F around the lower edge of the bell, for the purpose of increasing its buoyancy, and to diminish the quantity of glycerine or other fluid necessary for the safe and efficient working of the governor.

It is found advantageous to attach the flexible diaphragm or cover D to the valve rod or stem G by a nut; and to secure the edge of the diaphragm or cover to the outer surface of the gas chamber by cement or other adhesive material, and then fit tightly over it a metallic ring or band.

At the base of the gas chamber is an annular valve, and at the top and bottom of it is a valve-seating (or flat seating), in order to receive the controlling-valve of two inverted cups I (or flat valves) ground into the seatings.

Manufacture of Illuminating and Heating Gas.—Klönne, A., of Dortmund, Germany. No. 1575; Jan. 26, 1892.

This invention relates to a method of eliminating the impurities of the gas in such a way, and at such a stage of the process, that the heavier illuminants cannot be absorbed by tar. These impurities are: Tar, carbonic acid, sulphuretted hydrogen, bisulphide of carbon, ammonia, and other sulphur compounds. The heavier illuminants

are: Propylene, butylene, &c., and benzol and naphthalene vapours, "which latter give the gas a great illuminating power, but which are readily absorbed by the tar as soon as its temperature falls below 95° Fahr." The process referred to removes the tar in such a way that the gases cannot come in contact with tar-wetted surfaces when the cooling and purifying process proper begins.

Fig. 1.

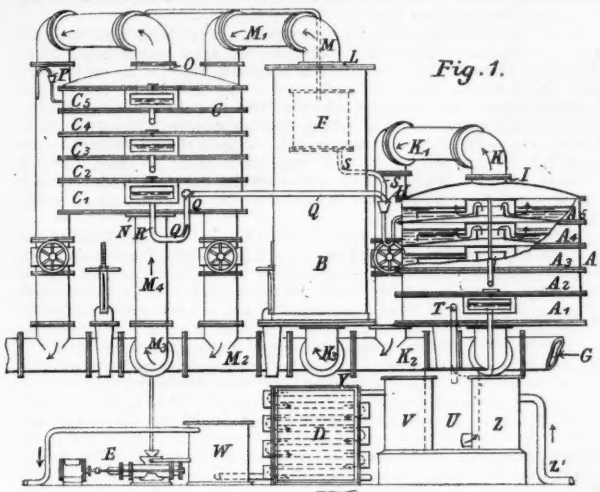
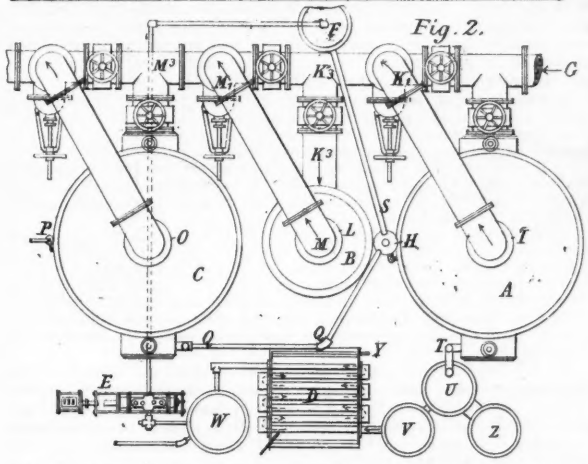


Fig. 2.



In carrying the invention into practice, there are employed: A washer A (called the "cooling washer"); a compensator, B; an ammonia extractor, C; a cooler, D; a pump, E; and a storeage-tank, F. The cooling washer and ammonia extractor are of the style known as an "immersion" washer; the compensator is similar to a gas condenser and tar separator; the cooler is a surface condenser, similar to one for cooling and condensing anhydrous ammonia vapours, used in ice and cold storeage factories; the pump is specially constructed for pumping ammoniacal liquor or gas water; and the storeage-tank is an ordinary one, into which the cool ammoniacal liquor is pumped. All the pipes and valves are so arranged that the gas and ammoniacal liquor can be conveyed from one part of the apparatus to any other, with the necessary bye-pass valves to admit of the temporary cutting-out of the series and cleaning of one apparatus while the others are in use.

After having passed the exhausters, the gas enters a friction or air or water surface condenser (not shown) if needed to ensure that it reaches the inlet G at a temperature of from 75° to 100° Fahr., preferably at from 90° to 100° Fahr., and as long as the solid impurities (such as coke dust, heavy pitch, &c.) have been removed. From the inlet the gas enters into the bottom section A^1 of the cooling washer, where it immediately has to plunge through ammoniacal liquor, whereby part of the tar drops into the liquor without having a chance to absorb any of the heavy hydrocarbons mentioned. The temperature of the gas is thereby lowered also. The gas then passes consecutively into the other sections (A^2, A^3, A^4, A^5) of the cooling washer, where it loses all its tar and all the carbonic acid, and as much sulphur as the ammoniacal liquor —which enters at H, and contains a great amount of caustic ammonia —is able to absorb and transform into carbonates and bicarbonates of ammonium and sulphates and bisulphates of ammonium. The gas in the meantime has given up part of its heat to the ammoniacal liquor, and leaves the cooling washer at I, at a temperature of from 60° to 70° Fahr., absolutely free of tar, which it generally is after going through section A^2 or A^3.

The gas passes from the cooling washer following the direction of the arrows K, K^1, K^2, K^3; and it enters the compensator B. The gas there is kept at an even temperature of preferably 600° Fahr.; and this compensator has only to fulfil the duty of keeping the gas as near as possible to a steady temperature, which otherwise would not be possible, as the flow of ammoniacal liquor which enters at H is nearly constant, while the quantity of gas manufactured at different periods during a twenty-four hours' run is always variable. For the sake of economy, this compensator might be omitted; but it is advisable that one should be used. The gas leaves the compensator at L, follows the direction of the arrows M, M^1, M^2, M^3, M^4, and enters the ammonia extractor at N. It passes the different sections C^1, C^2, C^3, C^4, C^5, of the ammonia extractor consecutively, and leaves at O free of ammonia.

To extract the ammonia, clear water, as free as possible of lime, is admitted to the ammonia extractor at P, flowing from section to section till it leaves at R. It is then thoroughly charged with the ammonia originally contained in the gas, and partly with sulphates of ammonium. From R it flows in the direction of the arrows Q, and enters the cooling washer at H, together with other ammoniacal liquor coming from the storeage-tank F through the pipe S. It then goes from section to section till it leaves the first or lowest section A^1 of the cooling washer at T. The water had naturally taken up part of the heat originally contained in the gas. From T the water passes into a tar and light-oil separator U, where these impurities are separated from the liquor, and flow through Z and Z^1 to the tar-well, while the ammoniacal liquor leaves the separator and goes through V, and, after entering the cooler, flows through pipes, which are continually cooled (preferably by water) down to between 60° and 65° Fahr.

After the ammoniacal liquor leaves the cooler, it enters a distributing tank W, where ammoniacal liquor equal to the quantity of clear water admitted into the ammonia extractor at P is discharged into the ammonia-well; and the balance passes to the pump E, and is then forced into the storeage-tank F for the repetition of the process.

If it is deemed advisable to remove all the sulphur impurities from the gas, it is necessary that there should be enough ammonia in the gas to chemically bind all the carbonic acid and sulphur compounds. This condition is scarcely ever fulfilled. To increase the capacity of the machine, it is necessary to make more caustic ammonia available to do the work. This is effected by letting all the ammoniacal liquor which comes from the hydraulic main and condensation ahead of this machine (which liquor contains a large amount of caustic ammonia) enter, either by gravity or by pumping, into any of the compartments of the washer A or ammonia extractor C—preferably in the compartments C^2, C^1, or A^5. Naturally it must not be introduced in C^4 or C^5. This introduction can be done as shown on fig. 1, at P and H. The amount of caustic ammonia will generally not be sufficient to free the gas of all its impurities by forming carbon and sulphur compounds of ammonia. If, therefore, the complete purification of the gas is deemed necessary and advisable, instead of, as is now generally done, passing the gas through oxide of iron or lime purifiers after leaving this apparatus, then an additional quantity of caustic ammonia in the shape of either aqua ammonia in its crude or purified state, or in the shape of anhydrous ammonia (the latter preferably in gaseous form) has to be procured.

If aqua ammonia is used, it is preferable to employ a weak solution not containing more than from 10 to 18 per cent. of ammonia, as otherwise the loss by evaporation would be too great. This solution could best be introduced at either C^1, A^5, or A^4. If anhydrous or an ammonia gas is used, then it should best be mixed with the gas before it enters the cooling washer. The quantity of ammonia required for the complete purification of the gas would differ according to the impurities originally contained in the gas manufactured, as all the time sufficient ammonia has to be present to absorb (by neutralization or chemical combination) the impurities of the crude gas.

Atmospheric Gas-Burners.—Brophy, M. M., of High Holborn, W.C No. 1874; Jan. 30, 1892.

This invention, relating to atmospheric gas-burners, is an improvement on patents No. 14,634 of 1888 and No. 6662 of 1890—in which provision is made for automatically lowering the gas when not required for use, and so prevent waste—the object of the invention being to reduce to a minimum the quantity of gas burnt when the burner is not in use. To this end, it consists in the provision of means whereby a small pilot-flame of pure gas will be left burning at the top of the burner, thereby permitting the supply of gas to the mixing chamber to be completely shut off. The valve for this purpose is arranged upon a rod having a conical head to completely close the aperture through which the gas passes to the nozzle in the mixing chamber; and through the rod is formed a passage communicating at the lower end with the gas supply, and having at the upper end a small aperture through which the gas for the pilot-flame passes. In order to permit of readily moving the rod for cleaning purposes, it is made in two parts—one provided with a male, and the other with a female cone, so that, when the two cones are in contact, the gas cannot escape between them.

Sale of Gas Shares.—At Preston, a few days ago, Messrs. T. Dewhurst and Son offered for sale £1000 of "B" stock of the *Preston Gas Company*, in lots of £100. The average realized was £145 per lot At Preston last week, Messrs. T. Dewhurst and Son offered for sale £200 of "A" stock in the same Company, which realized £191 10s. per £100. There was also offered £300 of "B" stock, which sold for £148 per £100 of stock.——At a recent sale, 13 original £10 shares in the *Maidstone Water Company* changed hands at £25 per share.

The Lynton Local Board and the Water-Works.—The Lynton Water Company have agreed to grant a lease of their works to the Local Board for 999 years, at a rent of £300 per annum, to commence from the 25th ult. The Company are to pay the Board £1000, being the amount of the costs incurred by the latter in opposing their Bill in 1891, and the balance of a sum of £500 allocated for the payment of the Company's costs in connection with the present application to Parliament. This Bill (to which reference was made in the JOURNAL for the 6th ult.) will not now be proceeded with.

The Future Gas Supply of Coventry.—At the meeting of the Coventry City Council to-day, the Gas Committee will submit a report on the future gas supply of the city. They express the opinion that the increase of gas during the next few years will be much less than 6 per cent., as was anticipated in 1891, and that for at least two years to come all the requirements of the undertaking may be met by a rearrangement of the present works. It is accordingly recommended that the consideration of the question of the future gas supply be adjourned. A table appended shows in detail the annual increases and decreases; the average annual increase for the past sixteen years being 6·51 per cent., the largest increases having been during the past five years. For the ten years previous to 1887, the average annual increase was only 4 per cent.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Purification.

SIR,—My attention has been called to a series of letters in the JOURNAL by Messrs. Stenhouse, Carpenter, and others, in which my experiments upon this subject have been freely quoted.

I trust that I may be allowed briefly to sum up the salient points of my investigations, which were carried on in Mr. Harcourt's laboratory under his direction, and published in the *Journal of the Chemical Society*, 1885, the *Journal of the Society of Chemical Industry*, 1885, and this JOURNAL, Vol. XLVI., p. 1174. Neither then nor now have I any desire "to put the results forward dogmatically or possessing infallibility." "*Humanum est errare.*"

(1) Hydrogen sulphide reacts with calcium hydrate to form calcium sulphide, the substance represented by the formula CaS. But this was found to be inert towards carbon disulphide; so that the chemical change represented by the equation $CaS + CS_2 = CaCS_3$, probably does not take place in the lime purifiers.

(2) Hydrogen sulphide reacts with milk of lime to form the hydrosulphide Ca $(SH)_2$ (*c.f.* Divers and Shimidzn, *Journ. Chem. Soc.*, 1884); but this substance was also found to be inert towards carbon disulphide. But if air, or hydrogen with carbon disulphide vapour (an artificial mixture made to resemble impure gas) be passed through a solution of the hydrosulphide, a considerable quantity of hydrogen sulphide is given off; and, simultaneously with the separation of the hydroxy hydrosulphide, Ca (OH) (SH), the absorption of the carbon disulphide commenced. Eventually, red crystals—familiar to gas engineers—were formed. These contained not only the hydrate, but also the sulpho-carbonate.

Such was the evidence, which I brought forward with a view of proving that the active material for removing the carbon disulphide in the lime purifiers was neither the sulphide, CaS, nor the hydrate, $Ca(OH)_2$, nor the hydrosulphide $Ca(SH)_2$.

I endeavoured to explain the inactivity of over-fouled lime, especially observed in cold weather (*c.f.* H. E. Jones, Proc. Inst. CE., Vol. LXI., Part ii.) by the formation of the hydrosulphide. "To restore its activity either air is blown into the purifiers"—the process adopted by Mr. Carpenter—"or the foul lime taken out, broken up and returned. In the former of these cases, the blast of air removes the excess of hydrogen sulphide, and causes the production of the active hydroxy hydrosulphide; while in the latter the change is effected both by the mechanical process of breaking up, thus exposing unaltered lumps of the hydrate to the action of the emitted hydrogen sulphide, and by the chemical reaction induced by exposure." As regards the latter point, Mr. Stenhouse to some extent reproduces my views. Of course, under the conditions of exposure or a blast of air, there would be oxidation, and consequent rise of temperature; but I am quite unaware of any quantitative experiments which show that the oxidation product—be it calcium sulphite, $CaSO_3$, or the hyposulphite, CaS_2O_3—would absorb the carbon disulphide.

There is a further point worthy of consideration, but not alluded to by your correspondents—namely, the amount of water added to the lime in the process of slaking. If this amount exceeds a certain (though, at present, unknown) quantity, there would be a greater tendency to form the hydrosulphide, and thus make the lime less active.

At present, I am engaged upon experiments upon the absorptive power of lime for carbon dioxide as dependent upon the proportion of water present. I hope shortly to be in a position to publish the results of these investigations; and I may probably extend them to the case of hydrogen sulphide. Meanwhile, I would welcome the results of any experience upon this point from practical gas engineers.

V. H. VELEY.

Oxford, Dec. 23, 1892.

SIR,—It was not my intention to trouble you with any further remarks at present on the subject of "Purification;" but as there is something so very mysterious in the last paragraph of Mr. Carpenter's last letter, I must ask your indulgence for a little more space.

The paragraph runs thus: "As regards the invariable presence of oxygen in the published analyses of purified coal gas, no gas engineer will require reminding that this need not have passed through the purifiers; its absorption being effected by the same material as Veley used in his experiments—ferrous sulphide." What these words mean, I am quite unable to determine. The average reader—whether gas engineer or otherwise—will also, I believe, have found them incomprehensible. Does the statement mean that purified gas ordinarily contains oxygen when none was present in the gas when it passed through the purifiers? If so, whence comes the oxygen? The suggestion that oxygen suddenly makes its appearance somewhere beyond the purifiers, ought to give great satisfaction to those gas managers and chemists who find an increase of one or more candles in the illuminating power when 0·1 to 0·2 per cent. of oxygen is present in the purified gas. For it to come so easily and cheaply, will be found very convenient.

THOMAS STENHOUSE.

Rochdale, Dec. 23, 1892.

[The above letters arrived too late for last week's issue.—ED. J. G. L.]

The Ulverston Gas-Meter Dispute.

SIR—I do not dispute the construction of meters, or the present mode of testing them, but the interpretation of an Act of Parliament. The mode at present in use for testing new meters is doubtless sufficient for all general purposes; but to test them for disputed registration is a very different matter. The fees for testing new meters are prescribed by the Act, and they must in all cases be paid by the parties supplying the meters; but the expenses in cases of disputed registration may have to be paid by either party, and must therefore be subject to arrangement.

With respect to the testing of meters, the Act provides (section 12) as ollows: "No meter shall be stamped which shall be found capable of registering more than 2 per cent. in favour of the seller, or 3 per cent. in favour of the consumer; . . and every meter which shall be found to measure and register quantities accurately, or not varying beyond the limits aforesaid, shall be considered to be correct, and be stamped as aforesaid." There is nothing in these words, or in any other part of the Act, to require the testing to be limited to the 2 or 3 per cent.; on the contrary, they admit of the testing being continued to any extent that may be required.

Inspectors are appointed for the protection of those who buy gas, and not for those who sell it; and it does seem rather hard upon the buyer, after all this expense has been incurred for his protection, and he wishes to have his meter tested, to be told by the person specially appointed to protect him that the Act does not enable him to do that for which he has been so specially appointed. Nevertheless, if parties who appoint the inspectors will but give them instructions for the future to test all meters that may be brought to them for that purpose, and for any quantity that may be required under proper arrangement, there would soon be an end to these disputes about wrong registration.

With respect to the letter of "Tobias Canis," in the JOURNAL for Dec. 20, I fully agree with him as to the duties of the inspectors. But I differ from him as to the application of the Act; and as this is important, I hope you will permit me to explain my views somewhat more at length than I have done hitherto, and my reasons for adopting those views. Mr. Gay's letter, in the same number, is to me inexplicable, as I cannot understand how a meter can be made to register an unlimited quantity of gas at one time, and to be exactly correct at another; my own opinion being that it is impossible.

The Sale of Gas Acts, 1859 and 1860, were promoted at the instance of certain meter makers, who seem to have had but a very imperfect knowledge of what they would have to provide for the purpose of carrying them out; and hence the provisions are so intermixed and confusing that it is hardly possible to ascertain, from the reading of the Acts themselves, what their true interpretation really is. The preamble of the Act of 1859 recites that "it is expedient that the measurement used in the sales of gas for lighting, heating, and other purposes should be *hereafter regulated by one uniform standard, and that all meters should be stamped.*" The Act provides as follows:—

(1) That the word "meter" shall mean gas-meter, "*and shall include every kind of machine used for measuring gas.*"

(2) That after the passing of the Act, "*the only legal standard or unit of measure* for the sale of gas by meter shall be the *cubic foot.*"

(3) That within three months after the passing of the Act, the Commissioners of Her Majesty's Treasury shall have carefully made models of gasholders, with stamps of a uniform design, to be used "*for stamping meters throughout the United Kingdom.*"

(4) That within nine months after the passing of the Act, the Justices of the Peace *of every county, riding, or division, or county of a city, or county of a town* in General or Quarter Sessions assembled, and in such boroughs as may adopt this Act, as hereinafter provided, . . . shall determine the number of the said models, &c., *which they shall deem requisite for testing the meters within their jurisdiction, and shall appoint a sufficient number of inspectors, &c., for the safe custody of such models, stamps, &c., and for the discharge of the other duties hereinafter mentioned.*

By the foregoing provision, it was made compulsory upon all counties to appoint inspectors and provide testing-places for carrying out the provisions of the Act; but it was left optional for boroughs to do so or not as they might deem expedient. The reason of this was simply a matter of expense, and that alone. During the proceedings on the Bill, it was explained to the Committee that a meter maker might have his factory in a borough, and at the same time be close to a testing-place belonging to the county, and that all the meters he made might be sent to the testing-place of the county, and not to the borough. The Committee thereupon made it optional for the borough to appoint inspectors, and provide separate testing-places or not as they might deem expedient. In the same section, a few lines farther down, an explanation is given as to what the boroughs would have to do if they decided to adopt the Act; and this was "to determine the number of copies of the said models of gasholders with proper balances, indices, and apparatus as aforesaid, which they shall deem requisite for the testing of meters within their respective jurisdictions." It never was intended for one moment to exempt boroughs, or any other places or persons, from the provisions of the Act, but only to relieve them from the expense of appointing inspectors and establishing separate testing-places belonging to a county close at hand. If the clause is read attentively, it will be found that this is all it really does provide for at the present time. To prevent any possible misconception on this point, it is provided—

(5) That the jurisdictions of Justices, Town Councils, Town Commissioners, and Grand Juries *shall extend to all meters out of such boroughs or towns for measuring gas* manufactured at any gas-works by which any such boroughs or towns shall be supplied with gas; and further that where any municipal authority has power to appoint inspectors to examine and stamp meters before the passing of this Act, all such powers *shall be repealed, and the provisions of this Act shall supersede such powers.*

(10) No meter duly stamped *under the authority of this Act* shall be liable to be re-stamped, although the same be used in any other place than that at which the same was originally stamped, *but shall be considered as a legal meter throughout the United Kingdom.*

(18) That, after twelve months from the passing of this Act, *no meter shall be fixed for use in the sale of gas without having been previously tested and stamped; and any person using such a meter shall be subject to a penalty of five pounds.*

(17) That, after the expiration of ten years, all meters whatsoever not previously stamped, which shall be used for buying and selling gas or collecting rates and duties, *shall be examined, tested, and stamped under the authority of this Act; and every contract, bargain, or sale made by any such meter shall be void,* and any person using such a meter shall be subject *to a penalty of five pounds.*

From these and several other similar provisions throughout the Act, it is beyond all doubt that the Act is intended to apply, and does apply, to every corporation, company, or individual supplying gas, and to every company or person using gas as an ordinary consumer *in any part of the United Kingdom of England, Scotland, and Ireland.*

(9) Inspectors *shall attend with their apparatus,* &c., on such days, at such hours, and at such market towns within their jurisdictions, as the Justices shall deem expedient.

(18) All meters required to be stamped *shall be delivered to the inspectors at the places where such testing gas holders and apparatus shall be kept.*

(10) Meters stamped in any one place may be used in any other without being re-stamped.

The explanation of these contradictory provisions is that at first it was intended that gas companies should provide for testing their meters for their own consumers; and it was therefore made compulsory upon counties to provide testing-places, with apparatus, &c., for the purpose. But during the proceedings, it was found necessary to transfer the testing from the companies to the makers; and the Act passed in that shape.

After the Act had passed, it occurred to the counties that, under the altered arrangements, it would not be necessary to make it compulsory upon the counties to provide testing-places any more than upon the boroughs; and thereupon the Act of 1860 was introduced to abolish the compulsory power, and place counties on the same level as boroughs —that is, with a permissive power only. The provisions in the Act of 1860 are as follows:—

Notwithstanding anything in the said Act (1859) contained, it shall not come into operation in any county of England until the Magistrates of such county in Quarter Sessions shall have resolved to bring such county under the operation of the Act.

This provision, it may be inferred, has led to many counties not adopting the Act, under the belief that by so doing they evaded the Act altogether; but that is a mistake. Section 4 of the Act of 1859 gives the meaning of the words "the adoption of this Act;" and, in the absence of any other provision respecting it, that must be held to apply to the Act of 1860. If it had been intended to exempt any localities or persons from the operation of the Act, there would have been a special clause to that effect. But there is not a single exemption throughout the measure; and all its provisions are so absolute in themselves that it is impossible to suppose that any exemption exists at the present time, or that it was ever intended that there should be any.

W. LIVESEY.

76, Palace Chambers, Westminster, S.W.,
Dec. 29, 1892.

Withdrawal of the Charges against Mr. Hammond, of Eastbourne.—The following paragraph, which appeared among the "Local Notes" by "Publicola" in the *Eastbourne Gazette* on the 28th ult., refers to a matter which formed the subject of an advertisement in the last number of the JOURNAL: "I am sincerely glad to find that the difference that arose between Mr. T. Arkcoll and Mr. Hammond (the Manager of the gas-works) has been adjusted without a resort to that litigation in the High Court, which is often as expensive and troublesome to the winner as to the loser. The circumstances of the case were briefly these: Mr. Arkcoll, who had been for many years a Director of the Gas Company, failed to gain re-election at the meeting of the shareholders—being opposed by a strong resident candidate. Naturally, he was annoyed at this; and he erroneously attributed his defeat to Mr. Hammond, against whom he made—in the heat of the moment—some transparently unfounded allegations. These he has unreservedly withdrawn and apologized for. Mr. Hammond was bound to vindicate his character, and he has acted with a forbearance that redounds to his credit."

New Joint-Stock Companies.—The following joint-stock companies have lately been registered: The St. Blazey Gas Company, Limited, with a capital of £2000, in £1 shares, to acquire the undertaking of the St. Blazey (Cornwall) Gas Company. The Corunna Water-Works Company, Limited, with a capital of £160,000, in £1 shares, to acquire, by purchase or otherwise, and to carry out, a concession for the establishment of water-works for the supply of the city of Corunna with water from the River Barces and its tributaries (this concession having been granted, on June 20, 1892, by the Municipality of Corunna, to the British and Foreign Trading Company, Limited); to supply with water such other districts and neighbourhoods as the Company may select for that purpose, and to provide vessels, engines, and machinery with water and water power from the establishments of the Company. The Absolute Safety Lamp Company, Limited, with a capital of £10,000, fn £1 shares, to acquire and turn to account certain patents relating to improvements in mineral oil lamps, and to carry into effect an agreement made and entered into between G. Brodrick, S. A. Johnson and C. Brodrick

The Failure of the Electric Light in the City.—In reference to the article on this subject which appeared in the JOURNAL last week, an official of the City of London Electric Lighting Company, Limited, made a statement in the *Pall Mall Gazette* last Thursday. He says our report was "grossly exaggerated." He admits that "a few street lights were certainly out on Sunday evening, the 18th of December, through no fault of the system, however, but from trouble with a few of our lamp-trimmers." He then goes on to say that "every one, even a gas company, as we know, is liable to these accidents. Perhaps yesterday (Tuesday) the Gas Company's men failed them, as during the better part of the fog the gas-lamps were not lighted in the streets not yet taken over by us. For instance, in such an important thoroughfare as Mansion House Street the City police lighted the gas-lamps. The Gas Company may have lighted the gas in the streets named in the report; but in several of them there is not a single electric lamp, and in others the gas has only partially been replaced. As to a 'notice,' we had to send twice to the Gas Company to get them to light up. Ludgate Hill was not lighted until 7.45 p.m. We absolutely deny that any of our lamps in Moorgate Street failed on Dec. 14, or on any other evening mentioned in the report. Fore Street and London Wall are on separate circuits, and are supplied from separate stations, a mile apart, and no failures have taken place in those two streets. We deny that the gas-lamps were lighted in Moorgate Street on the evening of the 15th; for no instructions were given to the Gas Company to do so, either by the Commissioners of Sewers or by this Company. As a matter of fact, the electric light is such a success that there is no doubt that every gas-lamp in the streets will soon disappear. The electric light has come to stay; and the officials of the gas companies would do better to spend their time in finding further outlets for their productions than in manufacturing garbled reports."

MISCELLANEOUS NEWS.

PROPOSED GENERAL LABOUR EXCHANGE FOR GREAT BRITAIN.

The following particulars in regard to an important movement which has been set on foot for establishing a General Labour Exchange for Great Britain appeared in the *Globe* on the 28th ult.:—

Early in the present year [1892], we had occasion to point out that individual capitalists and groups of capitalists, in the shape of employers' associations, were gradually, but surely, drawing together, and discussing a variety of projects for the protection of trade by putting a backbone into the disorganized ranks of free labour. At the time we ventured to predict that the suggestions thrown out—then more or less vague and general—might be expected to develop shortly into a definite scheme; and to-day that stage has been reached. The name of the new organization is to be the British Labour Exchange; its scheme and programme are distinctly outlined in a private circular which has recently been issued to those interested; and the details have been unofficially agreed to by some of the most prominent employers of labour in the country. It is now merely a question of an inaugural meeting to launch the project in an official manner; and this would have taken place some time ago but for the illness of one of the principal promoters, who is now convalescent.

We are not at liberty to say a great deal about the British Labour Exchange as yet; but, on broad lines, we can point out that it proposes to exercise its influence over the whole country and in all trades, in a similar manner to that exercised by the Shipping Federation at the various seaports over its own special industry. It will start registration offices in all labour centres, and issue tickets to all those who are willing to take work on free labour principles—that is to say, applicants will be expected to undertake not to molest other men in employment, and in return will themselves be guaranteed protection from molestation. The various branches will be in intimate touch with the London centre, which will receive constant reports as to where men are wanted, and as to where there is a glut of labour; thus giving free labour the pick of the work throughout the kingdom, from which it has been systematically boycotted for so long by the trade agitators and their dupes. The proper working of the Exchange should thus have the proper effect of equalizing supply and demand in the labour market—minimizing the congestion of the unemployed in slack districts, and readily finding men to take work in more fortunate neighbourhoods. Another and excellent feature in the programme is the eventual adoption of a colossal benefit scheme; but this, though a very essential point in the long run, can only be worked out after the organization has been in existence for a time.

The success of the new venture will depend a great deal on the simplicity of its aims, and on the moderation and firmness of its policy; and it is satisfactory to learn that, while upholding the rights of the free labourer, it is by no means the intention of the promoters to boycott the members of trade societies. Unionist and non-unionist will be treated alike from the moment one or other accepts the ticket. That a serious blow to the New Unionism will be dealt, goes without saying; for the fact of the existence of the proposed organization will enable the thousands of trade unionist malcontents to escape from their societies and their attendant blackmail, and yet have a chance—in fact, a far better chance—of obtaining work and of keeping it. But serious trade unionism should receive no check in the long run at the hands of the new organization; for although one may naturally expect to see, as an immediate result, a formidable decrease in the ranks of the "society men," it would merely point to the fact that such of them as had been unionists by force, or by force of circumstances, were withdrawing their support, which at best had been of a purely nominal nature. Consequently, if the trade societies wish to retain their members, they would have to alter their programme to meet the popular and more reasonable views of the real working man. Bearing in mind the fact that free labour is said to represent at least 85 per cent. of the working population, and that the British Labour Exchange is to be essentially a free labour institution, it is only reasonable to suppose that its advent will be welcomed alike by master and man. Of its influence we can only say, that if its official adherents, after it has come into existence, are to be at all in proportion to present applications, this new federation should represent, within a few months of its starting, a capital of somewhere about £1,000,000,000 sterling. It is stated that two organizations which have informally undertaken to support the scheme alone represent a capital of over £200,000,000.

That something of this sort was needed has long been seen; but the way to accomplish it on a wholesale scale had not been practically solved, owing to the vastness of the subject, the proverbial apathy of masters, and the pitiful incompetency of most of the masters' associations. However, force of circumstances has at length shown those interested that the labour question must be faced; and many employers, who were wont to whiningly complain that it was impossible to offer any successful opposition to the self-seeking charlatans who have hitherto posed as the men's representatives, have come to see that it is impossible to do otherwise than oppose them tooth and nail, systematically and honestly. It is now very generally conceded that trade has not only left the country to a very serious extent, but that much of it can never return to us. A representative organization which will tend to check a further transferring of our industries to the Continent and elsewhere cannot but command a large amount of sympathy. At a time when "labour leaders" have reduced the demand for labour to a minimum; at a time when we are asked to find work which is not needed, for the purpose of charitably employing men for whose starvation these "labour leaders" are so largely responsible; at a time when the Board of Trade (our only official source of information) is so imperfectly *au courant* with the subject of labour as to be only in a position to base its labour statistics on the returns of a paltry few of the trade societies which represent an infinitesimal and biassed portion of the working population; at a time when a labour leader of the notoriety of Mr. Tom Mann seriously proposes to the Labour Commission as a remedy

for receding trade that England should "cease to be the market of the world," and manufacture only for its own requirements—we may surely be said to have arrived at a state of things which renders it essential that the interests of trade and labour should be placed on a business footing in the hands of competent and responsible persons, instead of being left, as heretofore, to the tender mercies of the paid agitator, the shallow theorist, the Socialist orator, the professional philanthropist, and the juggling politician.

THE GAS QUESTION IN PARIS.

Rupture of Negotiations with the Gas Company.

With the close of the past year, a matter which has for a long time been occupying the attention of the municipal authorities of Paris—the question of entering into a fresh Treaty with the Paris Gas Company, whereby a reduction could be effected in the price of gas—reached a stage which may perhaps be best described by the very common word "shelved." Our readers may remember that, in the JOURNAL for Oct. 18 last (p. 684), we gave the principal points in the new agreement which had been provisionally settled with the Gas Company by the Streets Committee of the Municipal Council, approved by the Prefect of the Seine, and only awaited the sanction of the Municipality as a body. The whole question had been fully reported upon by M. Sauton, the Vice-Chairman of the Committee; and everything seemed in train for bringing the matter to a successful termination. His report was brought up for discussion at the meeting of the Council on the 26th of October: and, after a long debate, its further consideration was postponed till the next sitting. This took place on the 7th of November; but no conclusion was arrived at. The discussion was continued on various days during that month; and terminated on the 9th ult. All these discussions have been fully reported in small type by the *Journal des Usines à Gaz;* but towards the close they became far too long for the space at the disposal of our contemporary, and consequently they have been given in a supplement to the current number. And when it is stated that the report of the proceedings from Nov. 16 to Dec. 9 occupy 29 large quarto pages, no one will, we think, accuse the conductors of that publication of giving a curtailed account of an important public matter. The climax was reached at the meeting on Dec. 5. At the opening of the proceedings on that day, the President submitted an amendment he had received from M. Strauss and a number of his colleagues, and then informed the Council that the Prefect of the Seine would make a communication to them. This official stated that he had been in correspondence with the Gas Company, in order to have the terms of certain articles in the Treaty made perfectly clear. The Company had taken some time to reply; and their letter did not reach him till just at the commencement of the sitting. This statement was greeted with various uncomplimentary remarks on the conduct of the Company; and demands were made for the letter to be read. The Prefect objected; considering that such a course would be prejudicial to the negotiations in progress. However, as there were reiterated calls for the letter, he eventually read it. He was frequently interrupted, while doing so, by the sarcastic comments of various councillors. Without attempting to give the text of the letter, which dealt with three points, it will be sufficient to state briefly the principal one on which the whole matter collapsed. It appears that the Company have been advised that there is nothing in the Treaty of 1870 to justify the supposition that the City is to take possession of the distributing plant at the expiration of the present concession, without making compensation to them; and that, in the absence of any stipulations to the contrary, they will retain possession of all their fixed and moveable property, with the exception of the mains, subject to arranging with the City the share of profits to which each of the parties will be entitled as at the 31st of December, 1905. This was contrary to what had been generally understood; the idea entertained being that the mains would belong to the City without indemnity. The letter gave rise to a warm debate, in the course of which the Company were accused of shuffling. The Prefect appealed to the more turbulent members to discuss the matter calmly. Eventually, M. Sauton moved that the letter should be referred to the Streets Committee—not with the view of re-opening negotiations with the Company, but to enable them to consider the situation; and his motion was agreed to. At the meeting of the Council on the 9th ult., the Chairman of the Committee (M. Rousselle) brought up two resolutions for confirmation—one to the effect that the Committee regarded the declarations contained in the Company's letter as a rupture of the negotiations on the gas question, and threw upon them all the responsibility for their failure; the other asking the Administration to inform the Council as to what steps they should take to ensure the use by the Company of good material in all their canalization operations, in view of this part of the plant becoming the property of the City in 1905, in accordance with article 51 of the Treaty of 1870. Both of these resolutions were confirmed with unanimity. M. Rousselle said he thought the Council ought, before bringing matters to a close, to thank M. Sauton for the trouble he had taken in connection with the question, although, unfortunately, his labours had proved abortive. M. Vaillant remarked that there could not be any ambiguity about the situation. It meant a complete rupture with the Gas Company; and there would be no possibility of again taking up the convention, or any similar one, with them. M. Muzet said he desired to point out that the Committee would still have the question as a remit to them, so that the consumers would not suppose that the subject of reducing the price of gas could not be brought forward again until 1905. M. Odelin said the consumers might suppose what they pleased. No one else wishing to speak, the discussion closed; and thus ended all the talk on the gas question.

New Water-Works for Haverhill.—On the 22nd ult., Colonel J. O. Hastead, one of the Inspectors of the Local Government Board, held an inquiry at Haverhill respecting an application by the Local Board for sanction to the borrowing of £8400 for water-works purposes. There was no opposition.

THE COAL TRADE OF THE PAST YEAR.

[From *The Times*, Dec. 31, 1892.]

The past year has been in some respects one of the most eventful that the coal trade of Great Britain has ever known. During no previous year have coalowners experienced more difficulty in adjusting the cost of production to the selling price; and hence it has been found necessary to demand considerable reductions in the rates of wages paid to the miners, which, in the three previous years, had generally been advanced by between 30 and 50 per cent. The process of reducing wages is always a troublesome and difficult one; and in 1892 it did not prove less so than usual. Several strikes took place as a consequence of proposals to lower the rate of wages, and much loss to owners and suffering to miners naturally followed. The attempt made in February to keep up the price of coal by a general suspension of production was, in some respects, a new departure. But it failed of its intended aim; and, despite the general stoppage of work by the members of the Miners' Federation, and the large curtailment of output due to the strikes in Durham and elsewhere, prices have continued to fall.

Although there has been a good deal of complaint made during the past year, on the ground of lower prices for both home trade and export, it does not seem, from the export returns of official values, that the average price realized in 1892 was much below the average of the previous year. Up to the end of November, the total exports of coal for the year amounted to 27,851,000 tons, which is stated as worth £15,489,000; being an average export price of 11·12s. per ton. The highest average value returned for any recent year was 12·62s. per ton for the year 1890; and in the following year it was returned as 12·16s. per ton. The average value of the coal exported for 1892 has been returned at a fraction over 1s. per ton, or, roughly, 8¼ per cent., less than the average price of 1891. On the total coal exports of 1891, which amounted to 31,084,000 tons, this would represent a fall in value to the extent of upwards of £1,500,000 sterling. But there is reason to suppose that in some cases the falling off was considerably more than 1s. per ton; and for manufacturing fuel the shrinkage has been in many cases fully 1s. 6d. per ton.

Taking the output of coal in the United Kingdom as a whole, it appears that the average official value of our production did not, up to the year 1888, with one or two exceptions, exceed 5s. 9d. per ton. In 1886 and 1887 the average fell to 4s. 8d. per ton, which was about the lowest annual average recorded. From this point the trade began to improve. The average of 1889 was 6s. 3d.; that of 1890, 8s. 2d.; and that of 1891, 7s. 9d. It is thus apparent that the average price of coal had nearly doubled between 1886-7 and 1890, and that the last-named year was the high-water mark of prices. Coincidently with this large increase of average value, the quantity of coal produced showed a large advance; the total increase of production between 1886 and 1891 being not less than 28,000,000 tons—an increase more than equal to the total annual production of coal in France, and about one-third more than the total for Belgium. Since 1890 the average value of our coal output has shown a decrease. The average for the year 1891 was 7s. 9d. per ton; and for 1892 it is expected to be considerably under the average of 1891, although no official records of the difference are as yet available.

The remarkable fluctuations that have occurred in the coal industry of Great Britain during the last few years may be illustrated by a few simple facts, borrowed from the *Mineral Statistics*. Comparing 1887 with the year 1890, there was an increase in the average value of our coal production to the extent of 3s. 4d. per ton, which figure, as applied to the production of the latter year, would yield a total increase on the average value of 1887 of about £30,000,000 sterling. Again, if we compare the total official value of the coal output of 1887 with that of 1891, the latter year shows an increase of about £32,000,000 sterling. The distribution of this large sum has not, however, necessarily meant profits to that extent. On the contrary, although the average price of coal, as between the worst and the best years of the last decade, has been upwards of 3s. per ton, the greater part of that difference has been absorbed in the increased cost of production—in higher wages, heavier charges for stores, more expensive standing charges, and other items of cost. It is difficult to apportion to each of these items its due share of the increase of working cost; but the coal-owners generally have not been carrying on a particularly successful business while the higher rates were current, except in the earlier period of the rise. Since the commencement of the year 1892, coal-owners have failed to keep up their old rates. An artificial increase of price took place in the latter part of February and the early part of March, due to the fact of some 350,000 to 400,000 miners having stopped work for a time. But this event was of short duration; and it is doubtful whether it assisted in any material degree to keep up prices. In the North of England, the more general suspension of labour was followed by a strike of miners in the county of Durham, which lasted for nearly three months. This was probably the most disastrous strike that has ever occurred in the history of the coal trade, inasmuch as it not only caused the pits to be stopped, and not a few of them to be drowned out and otherwise injured, but the stoppage of coal supplies caused a serious paralysis of the manufacturing industry of the North of England generally. Probably the worst sufferer was the iron trade of Cleveland, which depends entirely on Durham for coal supplies, and receives therefrom not less than 5,000,000 or 6,000,000 tons annually. Deprived of coal and coke, the blast-furnaces of Cleveland were either damped down or blown out, and the iron trade of the north-west coast was similarly affected. The suspension of labour in the Durham coal industry is estimated to have involved a loss to these two districts, in the iron trade alone, of nearly, if not quite, £2,000,000 sterling. The loss to the coalowners, and to the miners on strike, may be judged by the fact that the production while the strike lasted must have been reduced by 9,000,000 or 10,000,000 tons. In the long run, the miners had to resume work on the terms originally offered by the mineowners; so that they gained nothing by their protracted sufferings. The wages now paid in the Durham coal trade, and throughout the coal industry as a whole, are still higher than those paid previous to the advance that appeared in the latter part of 1888; and it is only too evident that further reductions of wages

will be required in order to enable the employers to meet the steady fall of the market.

Since the Durham miners and the miners of one or two other districts have come to realize the fact that coal is falling in value, and that mineowners have a difficulty in producing it at a profit, they have begun to think more seriously of the future; and it appears to be probable that they will return to the sliding-scale system, which has regulated the rate of wages paid, both in the North of England and in South Wales, for a number of years. The difficulties that have led to the abandonment of this system in one or two cases, are not insuperable. What is required is, first, that the maximum and the minimum rates payable under the scale are neither too high nor too low, and next that the scale responds with sufficient alacrity to the changes in the market. The Miners' Federation, which has its head-quarters in the Yorkshire coal-field, and which brought about the foolish panic as to the supply of coal by a suspension of work in February last, is opposed to the sliding-scale system, and professes that the workmen can make better terms with their employers by holding themselves quite independent. The Welsh miners, who have not hitherto joined this federation, have for a few weeks past been in a condition of doubt as to whether they should throw over the scale or throw over the organization referred to. The miners appear to be dissatisfied with the recent operations of the scale, which have caused their wages to be considerably reduced during the last 18 months. On the other hand, the scale has now been in operation for a number of years, and has kept the relations of the two parties on a fairly friendly footing.

Although the exact statistics of production and consumption in the coal trade of the United Kingdom during 1892 will not be ascertained for some time to come, it is perfectly clear that there must have been a large falling off, as compared with either of the last two years. The production of pig iron during the first half of 1892 showed a reduction of well on to 1,000,000 tons; while the volume of finished iron and steel, shipbuilding, engineering, and other industries that consume coal on a large scale, must have proceeded on much the same lines. Our coal exports, again, have fallen off to the extent of more than 800,000 tons for the first eleven months of the year; and as the winter has been a mild one, and the general condition of business is depressed, it is probable that domestic consumption has been less than usual. The twelve principal railway companies have been paying about 1s. less for coal than they did in 1891; so that their outlay on this head for the first six months of the year was only at the rate of £2,956,000 per annum, as compared with an actual expenditure for coal of £3,113,000 in 1891. In 1888, when coal was cheaper, the same companies only expended £1,743,000 on their coal bill.

The coal trade, which is the foundation of the general manufacturing industry of the country, is at the same time the principal source of our shipping progress and prosperity, and contributes to the coffers of the railway companies a larger annual amount than any other single source of revenue except passenger traffic. It is natural, under these circumstances, that the coal industry should have been regarded very leniently in the recent parliamentary revision of maximum rates and charges. There are some who appear to think that the Legislature, as well as the Board of Trade, has made too much concession to this industry, and that it has unduly profited at the expense of the pig-iron and other industries, which likewise contribute a large volume of traffic, although placed in a higher class. But the railway companies have generally and consistently acted on the principle that cheap coal will admit other commodities to share the general prosperity which all desire, whereas dear coal would be certain to hinder the development of manufactures. On examining the new maxima, and comparing them with the old, it will be found that the coal trade is likely to be in a more advantageous position than that occupied by it under the old schedules. Taking as typical the schedules of the North-Western system, it appears that the new rates do not much differ from the old up to 10 miles. Beyond that distance, the new maxima are considerably lower than the old; the difference in favour of the new rates increasing as the distance is extended, until for 100 miles the new rate comes to 5s. 10d., instead of 7s. 4d., which was the maximum under the old Acts. On the other hand, it is well to remember that Parliament has now distinctly recognized both station and service terminals; and that while the latter are not in any degree likely to affect the coal industry, the right to charge 3d. in the form of a station terminal, in each case where stations are used, is a new departure. It is quite true that, under the old Acts, a 3d. terminal was often charged for coal traffic, where stations were made use of. But this was not recognized as inevitable; whereas now the practice has become crystallized into a specific act. The coal terminal, however, will only apply, as a rule, to domestic coal traffic, and not to any extent to the traffic that is loaded at collieries, and unloaded at factories, furnaces, or works.

FATAL ACCIDENT AT THE ROTHERHITHE GAS-WORKS.

On Thursday, the 22nd ult., Mr. A. E. Carttar held an inquiry into the circumstances attending the death of George Cooper, aged 46, a workman in the service of the South Metropolitan Gas Company, which occurred at their Rotherhithe works on the previous Tuesday. Edward Harvey deposed that, about half-past eleven on the morning of the 20th ult., he was working with deceased and two other men near the top of the scrubber. The plate had been taken off the manhole, to allow the gas to escape, after which deceased walked out of the scrubber on to the platform surrounding it. Three minutes later witness heard shouts; and, upon going outside, he found deceased had fallen to the ground beneath. The platform was about 5 feet wide, and was protected by a rail 3 feet high; the supporting stanchions being 6 feet apart. Deceased spoke to witness a few minutes prior to the occurrence, and he was then apparently all right. He had never himself experienced any ill effects from the gaseous fumes; but he had seen other men rendered insensible, and fall down. He had not seen deceased upset by them. Cooper might have stumbled, and fallen underneath the rail. There had been no previous mishap. William Lloyd, who was working with deceased, corroborated the evidence of the previous witness. Charles Andrews, a foreman in the Company's service, stated that, as deceased stepped out on to the platform, he smiled, and remarked that he would "have a blow"—meaning that he would go out into the fresh air. When he (witness) heard the shouts, he ran down and saw deceased, who had struck a 20-inch pipe in his descent, lying on the ground with his head shattered, and quite dead. It was possible that deceased was overcome by the fumes; but he had not the appearance of it when he stepped on to the platform. About four years ago deceased suffered from the effects of inhaling gas. They then gave him milk and walked him about, after which he rallied. Mr. A. F. Browne, Superintendent of the station, said he was disposed to think that deceased was slightly affected by the gas when he fell from the platform. He wished to add that the Company spared no expense in making everything as safe as possible. After a short deliberation, the jury returned a verdict as follows: "That deceased met his death through falling from a gallery at the South Metropolitan Gas-Works, Rotherhithe, which might have been prevented by proper precautions and safeguards on the part of the Company."

It should be stated, in reference to the proceedings above reported, that, owing to the pressure on the postal service in consequence of the approach of Christmas, the Company's Solicitor was not in attendance at the inquest, or possibly the wording of the verdict might have been different. We may mention that the scrubber in question is about 20 feet in diameter, and 50 or 60 feet high. On the top is a house of the same diameter as the scrubber, with doors on each side, and large openings in the top. Outside the house, all round the scrubber, is a wide close-planked gallery, about 4 ft. 6 in. wide; and some 6 inches in from the outer edge is a strong hand railing of 1½-inch pipe, of the usual height. After brushing the distributing pipes of the revolving spreader, for which purpose a plate about 8 feet long by 1 foot wide had been taken off (the pressure of the gas having previously been reduced to zero), Cooper went on to the gallery for "a blow," as stated by the witnesses. There were really four men engaged; and the foreman and Mr. Browne, the Superintendent, were present. None of them saw any more of him until they had heard he had fallen over. It never occurred to anyone that the gas would overpower any of the men. The foreman never knew any man to be affected by the gas when doing this work; and no one suspected that it was the case with Cooper, particularly as he had a smile on his face, and seemed quite well, when he went out on to the gallery.

ELECTRIC LIGHTING FOR HANLEY.

The Town and the British Gaslight Company.

At Hanley last Thursday week, Major-General R. D. Crozier, R.E., an Inspector of the Local Government Board, held an inquiry with respect to an application by the Town Council for sanction to borrow £21,000 for the purposes of electric lighting. The Town Clerk (Mr. A. Challinor) opened the proceedings by stating that the Corporation had carefully considered the question of electric lighting; and in 1890 they successfully opposed an application by the House-to-House Electricity Company, for a Provisional Order for the town. In January of the following year, the Council themselves obtained an Order under which they were compelled, within two years, to lay down the mains in the streets; and in September last they accepted the tender of the British Electric Engineering Company, amounting to £15,760, for works required for carrying out the requirements of the Order. There had hitherto been no opposition to the scheme; but, upon the requisition of five members of the Council, the Mayor had fixed Jan. 4 as the day for holding a special meeting to consider the position of the Council with regard to the matter. The Borough Surveyor produced plans and specifications; and Mr. Geipel, an electrical engineer, explained the nature of the plant and material required for the lighting of the compulsory area. The Mayor (Alderman E. J. Hammersley) then stated that for many years the British Gaslight Company had monopolized the supply of gas to the town; while, with the exception of Tunstall, which was also supplied by the same Company, the other towns of the Potteries possessed gas-works of their own. In 1877 an application was made to Parliament for special powers; but the position of the Company was so unique—they not being subjected to any of the obligations of the Gas-Works Clauses Acts, 1847 and 1871—that they were able to persuade Parliament not to grant to Hanley and Tunstall the same powers of supplying themselves with gas as were granted to Burslem, Stoke, Fenton, Longton, and Newcastle. Ever since they had been entirely at the mercy of the Company. In addition to paying instalments of principal and interest, and contributing to a sinking fund, Burslem last year paid over, from the profits of the gas-works, towards the rates a sum of £2200. The profits at Stoke were £2500; at Longton, £2300; and at Newcastle-under-Lyne, £1300. In 1880 the Hanley Corporation went to Parliament for powers enabling them to purchase the gas-works; but their application was resisted, and they failed to get any concession of a satisfactory character. The Company had declared that they could not earn their statutory dividends, and therefore they could not reduce the price of gas. The result was that, while the price had been lowered in other towns, Hanley was paying 3s. 6d. per 1000 cubic feet, until in 1887 it was reduced to 3s. as the result of litigation between the Corporation and the Company. The district comprising the compulsory area for electric light contained 53 gas-lamps, which last year cost £301; and it was proposed to replace these with 30 arc lamps of 1200-candle power at a cost of only £304. He contended further, that in the lighting of the public buildings, considerable economy would be effected. The maximum price fixed in the Order was 8d. per unit, and they hoped to supply the light at 6d. Several large ratepayers supported the application; while Mr. H. Palmer and others opposed the scheme, on the ground that the town was already over-burdened with rates. The inquiry occupied upwards of four hours.

Fatal Paraffin Lamp Accident.—Through the explosion of a lighted paraffin lamp without warning, on the 20th ult., the infant son of a miner named Hunter, residing at Barnsley, was badly burned, and died in the hospital the following day. An inquest has since been held, at which a verdict of "Accidental death" was returned.

GAS ENTERPRISE IN CHINA.

New Gas-Works for the Lighting of Kowloon.

A copy of the *China Mail* recently to hand contains an account of the new gas-works which have been erected for the supply of the district of Kowloon. It appears that the question of lighting this district had been for a number of years before the Directors of the Hong Kong and China Gas Company, Limited; but, like prudent business men, they were naturally disinclined to proceed with the erection of works, at a necessarily large expenditure of capital, until they had some reason for supposing that the future demand for gas would be likely to recompense them for the outlay. About six years ago, the present Manager (Mr. F. W. Cross) arrived in the colony; and, among other things, he took up this matter at the point where it had been left by his predecessor, and promptly entered into negotiations with the Government for lighting the district. It soon became evident there was a good prospect of doing business; and it was therefore deemed advisable to secure land in a suitable position and of ample size for the future requirements of the Company. Accordingly, in July, 1887, a plot of ground, having an area of 50,000 square feet, was secured; but no attempt was made to utilize it until there was a reasonable chance of a demand for gas. In the meantime, Kowloon developed, in both the European and Chinese quarters; and a large number of European houses were erected, and provision made therein for the use of gas. In August, 1891, instructions were received in Hong Kong by the Manager to go on with the erection of the works; and, everything having been prepared, tenders were accepted, and the work was proceeded with at once. It was anticipated the plant would have been ready for the supply of gas by September last; but unexpected delays took place, and the opening of the works was delayed until Nov. 1. The following is a brief description of them: The area is enclosed by a substantial boundary wall of red brick with cement coping; the entrance having on the right the house of the Resident Manager. The basement of this building is very high, by which two objects are gained—better health of the residents, and ample storeage. Above the basement are the offices and show-room; and above this the residential apartments. In the north-west corner, and to the right of the entrance, are situated the retort-house and coal-store, covered with a corrugated iron roof. The retort-bench has four arches; but only three are utilized at present. Outside is a tar-tank; and there is a second one underground. The engine and boiler house is in the south-west corner. There are two of Messrs. W. H. Allen and Co.'s exhausters, each capable of passing 5000 cubic feet of gas per hour. Only one, however, will be used for the present. Outside the engine-house is fixed a Morris and Cutler condenser; and by the side of it one of Messrs. C. and W. Walker's washers—this section of the plant being completed by four purifiers. Adjoining these is the lime-store; and close by is the station meter, which, with the governor, was supplied by Messrs. W. and B. Cowan. The gasholder is situated in the south-east corner of the site. It is of two lifts, each 15 feet deep, and is capable of holding about 45,000 cubic feet of gas. It is contained in a red brick tank, having a backing of puddle. The other buildings comprise the governor-house and the fitter's shop, stores, &c. In the centre of the yard is a well about 25 feet deep, from which water for use on the works is obtained by means of three steam-pumps in the engine-house. The whole of the buildings are erected in red brick, boldly pointed in cement, and relieved by arches and string courses of white bricks; the plinths and quoins of the doorways being of granite. While the buildings are plain, every opportunity has been taken to relieve the plainness as much as possible. The works have been so planned, and the apparatus distributed in such a manner, that ample room is left for future extension without inconvenience. Mains of various sizes have been laid all over the district. The works were designed by Mr. Frank Mead, of Sutton, Surrey; their erection having been carried out under the personal superintendence of Mr. Cross. All the building work was done under contract by a native; and most of the ironwork was supplied by Messrs. C. and W. Walker, and erected under the supervision of Mr. F. Weck, their representative.

Christmas Time at the York Gas-Works.—The usual distribution to the York Gas Company's workmen of Christmas gifts of toys, books, and useful articles of dress for their children, took place on Saturday, the 24th ult.; but, in consequence of the recent death of Mrs. Sellers, the Manager's mother, he (Mr. Sellers) did not deliver his usual Christmas address. In his absence, Mr. Leaf, the Assistant-Manager, spoke a few appropriate words to the men, and distributed the gifts.

Wotton-under-Edge Water Supply.—Mr. Cotterell was recently requested to prepare a revised estimate for a scheme for supplying Wotton-under-Edge with water from Hamlin's Brake; provision to be made for a storeage reservoir of 500,000 gallons. In his report, he states that, in order to the effect exclusion of suspended matter, he has provided in his scheme a small straining chamber from which stoneware piping will be laid to each of the springs; the water before entering the reservoir to be passed through the strainer. Mr. Cotterell estimates the cost of carrying out the work at £3890. An alternative scheme is under consideration.

Electric Lighting at Nelson.—At Nelson, last Friday week, the ceremony was performed of inaugurating the electric light installation which the Corporation have just established in the borough; and during the proceedings it was stated that Nelson had achieved the distinction of being the first Lancashire town where the local authority had completed public electric light works. The distributing-main cables are laid in the principal streets of the town; and tradesmen *en route* have become guarantors for the use of about 450 lights. The expenses connected with the installation are to be wholly met by the consumers of the light. The cost of the works has been about £4000. The generating station is at the Corporation gas-works; and the steam pressure of 80 lbs. required for driving the engines is supplied by the waste heat from the retort-house—thus economizing the cost of working the installation. The engine and dynamo are capable of supplying electricity for 600 lamps of 16-candle power each.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This has been a week of fog and of heavy consumption of gas. It was very dense in Glasgow on Tuesday forenoon—in fact, it was said to have been the worst fog experienced for several years. It is a pity that the new gasholder at the Temple works is not completed, because I observed that—I suppose to keep down the consumption and conserve the gas for evening lighting—the pressure was low, and the light indifferent. Continuous burning all day and evening is a heavy drain upon a gas-works; and it was doubtless a great relief to Mr. Foulis and his assistants when, towards the end of the week, the weather became clearer.

The Edinburgh and Leith Gas Commissioners met on Wednesday. They had before them the question of the disposal of waste lime, which has been a source of trouble to them for some time. A year or two ago they obtained permission from the North British Railway Company to lay down their lime at Loanstone, about 12 miles from the city; and a large quantity was put there. It was found, however, that the water supply of an adjoining village was contaminated by it; and on protest by the Mid-Lothian County Council, the Commissioners have, at great expense, had the whole heap removed. That did not, however, satisfy the County Council, who made a claim on the Gas Commissioners for the cost of introducing a water supply to the village. The claim has now been met by an offer on the part of the Gas Commissioners to contribute, without admitting liability, £55 as one-half of the estimated cost. For the future, they have obtained permission from the owners of the Prestongrange and Tranent estates to fill up several disused quarries with the lime. This work will occupy several years. The Works Committee, before making this arrangement, considered whether they should not introduce Mr. Hislop's revivifying process; but they came to the conclusion that it was inexpedient to do so in the meantime. The output of gas during November was reported to have been 171 million cubic feet—nearly 4½ million cubic feet less than in November of last year. In speaking of the decreased consumption, Mr. Kinloch Anderson referred to the deputation which had just returned from visiting places where electric lighting could be seen; and he urged that the Gas Commissioners should endeavour to make what improvement they could in the burning of gas. He introduced the subject of incandescent gas-burners, which he had seen in London, and declared that they gave a better light than an electric lamp. This led to a conversation about burners, in which Lord Provost Russell said they might talk to the public about the use of good burners; but it would not have much effect, unless they also told the public which were the burners best suited for Edinburgh gas. As a rule, he went on to say, the burners to be had in Edinburgh at present were made for London gas. He suggested that they should have a permanent show in their office of the burners which they recommended. A remit was made to the Works Committee to consider what could be done in the way of improved burning of gas, along with the subject of oil enriching, which has been referred to a Sub-Committee. The conversation was a very opportune one, because, with electric light in the near future, attention should be paid to everything which might improve the gas consumption. But the Lord Provost's remark about burners was surely not quite correct. That there are burners sold by inexperienced persons which are not suitable for local gas, is true of all towns; but to state that that is the rule in Edinburgh, is to say very little for the attention which has been paid by the officials of the gas undertaking to their duties. I cannot believe it to be the case, because I know that the officials do their duty; and though they do not instruct the public as to what burners they should use, I have no doubt they keep gas-fitters right on that subject. Of course, there are gas-fitters who are too conceited to be taught; but there are many others who are as studious in the matter of lighting as anyone connected with the gas supply, and who would be delighted to be informed of anything enabling them to give satisfaction to their customers.

Almost the same question was before the Town Council in Edinburgh on Tuesday. The customary report by the City Analyst upon the illuminating power of the gas was submitted, and then someone started to speak about the quality of the gas. In the conversation, the principal point dealt with was the size of the supply-pipes, which some thought to be too small. Nothing was said of any consequence, except one remark which led to a most comical resolution. The perpetrator of this comedy was Mr. Mitchell Thomson, a gentleman who is understood to have his eye upon the civic chair. What he did was to suggest that they should have a statement (from the Gas Commissioners) as to the analysis of the gas for the year. Will it be believed, the Council did not see the absurdity of the proposal? Adopting the suggestion, they instructed the Town Clerk to write to the Clerk to the Gas Commissioners to get the analysis. What a folly! and what a waste of energy! Mr. Mitchell Thomson is a business man, and doubtless he keeps the copy of the Town Council minutes which is sent to him. In these minutes, there is every month a report by the City Analyst on the illuminating power of the gas. All he has to do is, of course, to collect these reports, add together the figures for all the months, and divide by 12. That is all that will be done in the Gas Commission office; and it is a thing which he could quite easily do for himself. But when he gets it, of what use will it be? None whatever. I daresay Mr. Mitchell Thomson is anxious to keep himself before the community. That is quite a permissible thing; and if it were done intelligently, he would benefit by it. When, however, he does it in this way, he rather injures himself in the eyes of the councillors, who must, on reflection, see the absurd position he has led them into.

The deputation from the Edinburgh Town Council who have been in your quarter inquiring into electric lighting, have returned and, unofficially, an account is given of their doings. They visited Newcastle, London, Cambridge, Bradford, and Oxford. They were accompanied by a Mr. Murray, a Doctor of Science, who resides in Biggar, and who is said to be thoroughly conversant with electric lighting. Mr. Murray was taken in the capacity of expert, and received £20 for his services, which was surely altogether too trifling a sum to pay if his presence was of any value. In the last issue of the JOURNAL, I

wrote that Principal Grant Ogilvie and Professor Stanfield of the Heriot-Watt College accompanied the deputation as experts. What the object is I cannot understand; but there is a desire to keep it dark that those gentlemen formed part of the deputation, and I have been informed that the fact should not have been published. I cannot sympathize with such a feeling. What is there, or what should there be, to hide in connection with the matter? The more publicity the better. If the Corporation think to introduce an electric lighting installation by hole-and-corner methods, they will find that they are adopting a wrong policy. In London, the deputation visited the installations of the St. Pancras Vestry and of the City of London Electric Supply Company, with both of which they were greatly impressed. They seem to have formed a favourable opinion of the high-tension continuous current system; but it is too soon yet to say what they will recommend, as they have not yet themselves made up their mind. Their method of carrying out the inquiry was by means of a series of questions, to which tabulated answers were furnished by the engineers and managers of the works they visited.

In my "Note" two weeks ago with reference to water gas, I ventured the opinion that the use of the gas at the Uddington Station of the Caledonian Railway had been given up. I spoke from observation, and was mistaken; but the error arose very naturally, because only one platform is lighted by the gas, and it was the other one I saw. This week I passed through the station, and noticed it still in use on the north platform. The light is, or appears to be, quite equal to that which is given by coal gas on the south platform.

There have been three cases of poisoning by gas in Scotland this week. One, which proved fatal, was that of an old woman who lived alone in Glasgow. Another case occurred at Blantyre; and in this instance a whole family were attacked, but are recovering. In their case, the escape of gas was caused by a subsidence of the ground, the result of mineral workings below. The third was at Maryhill, near Glasgow. The whole family were affected by an escape of gas from the street; but they are all recovering.

The Works Committee of the Dundee Gas Commission have resolved to recommend the purchase of 18,000 tons of coal for the gas-works at 13s. 1½d. per ton.

In far-off Stornoway, there is a Gas Company, which seems to be flourishing, as extensions and renewals of works have just been completed at a cost of about £3000.

The Corporation of Paisley have long been distinguished for holding to the objectionable policy of compelling the gas undertaking to relieve the local rates. They have now taken a step which will put it in their power to relinquish the practice. A special meeting was held last week, at which a motion was submitted to the effect that, as serious differences had arisen as to the meaning of the term "depreciation," the Corporation should delay proceeding with an application for a Provisional Order to authorize the borrowing of money for gas-works purposes. The meaning of the motion was that matters should go on as at present, because in the Provisional Order it is proposed to enact that £1000 a year be written off for depreciation. The effect of creating a depreciation fund would mean that the gas undertaking would be managed for its own benefit, and not for the benefit also of other bodies. A majority of the Corporation took that view; and consequently the motion was rejected. Then Mr. Mathieson proposed the appointment of a Committee to inquire into the affairs of the Gas Trust on the following and other points: (1) To show the reason for the large amount of leakage of gas last year; (2) to show the reason for adding to the capital debt last year when they had a surplus; (3) to have the accounts in the balance-sheets stated so that they could be understood by any business man; (4) to show what had been paid for extensions out of revenue since 1870; (5) to show what amount had been paid into the sinking fund, and how it had been applied or invested since 1870; (6) to define in future what is understood as extensions, and what as repairs or renewals; (7) to report as to the shale refuse, and if it is of any value; (8) to consider whether the members of other Trusts should not hire their own horses and buy their own coal; (9) to consider the wisdom of introducing a new system of financing; and (10) to consider and report as to the value of the gas-works at present. That was a large order; and the Trust acted rightly in sending it for consideration in Committee. Mr. Mathieson, it should be added, disclaimed making any attack on the management of the gas-works, and said his only motive was to have all the Trusts managed in the best possible way.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Dec.* 31.

Sulphate of Ammonia.—The market has been dull as usual during holiday times; but it closes with a steady feeling, and a promise of a better state of things in the New Year. At least the considerable inquiry arising for spring delivery favours such a conclusion. The sales during the week are principally at £10 Hull and Liverpool, and at £9 17s. 6d. to £9 18s. 9d. f.o.b. Leith. A premium of about 2s. 6d. is obtainable for spring delivery.

LONDON, *Dec.* 31.

Tar Products.—Notwithstanding the holidays, considerable business has been done during the past week. Contrary to everybody's anticipation, benzols continue to improve. This is all the more remarkable, as a very large production, from an installation of the Semet-Solvay ovens in the North of France and Belgium, has come upon the market. Aniline makers declare that the present values are altogether unwarranted, as it is not possible to obtain a corresponding increase in the price of aniline. Carbolic and cresylic acid are still improving; and it looks as if the production is short of actual requirements. Unfortunately for distillers, the quantity of acids in tar continues to decrease with the higher heats and more skilful carbonization at the gas-works. Pitch appears to hold its own, as does also anthracene, though no new business is noted. Prices: Tar, 11s. to 12s. Pitch, 28s. 6d. Benzols, 90's, 1s. 11d.; 50's, 1s. 8½d. Toluol, 1s. 4½d. Solvent naphtha, 1s. 2d. Crude benzol naphtha, 30 per cent., 9d. Creosote, 1d. Creosote salts, 20s. Carbolic acid, 60's, 2s.; 70's, 2s. 3d.; crystals, 7d. Cresol, 1s. 6d. Anthracene, 30 per cent., "A" quality, 1s., nominal; "B," 9d., nominal.

Sulphate of Ammonia.—The price has fluctuated between £9 17s. 6d. and 10s. 2s. 6d., less 3½ per cent. The demand is good; and the market is distinctly firm. Large business is reported; and heavy shipments are being made. The future of sulphate is decidedly hopeful. Gas liquor is quoted at 6s. to 7s. 6d. per ton.

COAL TRADE REPORTS.

Lancashire Coal Trade.—During the past week, there has been but a very limited business doing in the coal trade of this district, owing to the holidays; and most of the pits were closed on Friday, for the New Year—operations not to be resumed until Wednesday or Thursday next. In the better qualities, for house-fire purposes, there has been a moderate demand, with prices steady at late rates, Wigan Arley still averaging, at the pit-mouth, 12s. to 12s. 6d.; Pemberton four-feet and second qualities of Arley, 10s. to 10s. 6d.; and common house-fire coals, about 8s. 6d. per ton. With regard to common round coals, the market not only remains without any improvement, but, if anything, there has been a lessened enquiry; and all descriptions of steam and forge coal remain a general drug. For inland requirements, ordinary descriptions of steam and forge coals scarcely average more than 7s. per ton; whilst for shipment, under this figure is being taken. Delivered at the Garston Docks or the High Level, Liverpool, common steam coal can be readily bought at about 8s. 3d. per ton, although the better qualities are perhaps not quoted anything below 8s. 6d. to 8s. 9d. per ton. The revised railway rates now coming into operation are giving rise to a great deal of complaints throughout the district, and so far, the general effect seems to be a decided increase in the cost of carriage. One main feature is the assimilation of the rates for round coal and engine fuel; but this has chiefly been a levelling up of engine fuel rates to those previously ruling for round coal—concessions upon round coal rates being very trivial. So much dissatisfaction is felt with regard to the revised rates, that colliery owners are talking about entering a strong protest against the increased charges which they will involve.

Northern Coal Trade.—There has been a broken week in the coal trade; and in consequence the stocks have been reduced, for the consumption is heavy. Northumbrian best steam coal is still quoted 9s. to 9s. 3d. per ton f.o.b.; and the pits have been very well employed. Second-class coal is about 1s. per ton less; and small steam coal is quiet, the price now quoted being from 3s. 6d. to 3s. 9d. Bunker coal is very low; and where contracts are entered into, they are at about 1s. per ton less than those for 1892. In gas coal, it is now stated officially that the large contracts of the Newcastle Gas Company have been placed for the present year at 6s. 9d. per ton—from 1s. 9d. to 2s. less than those that expired with the year. For odd cargoes of gas coals, the price asked is about 7s. per ton. Manufacturing coals are dull, stocks having accumulated. Coke is steady; and from 14s. 9d. to 15s. per ton f.o.b. is the current price. There is no alteration in gas coke.

Scotch Coal Trade.—The Scotch coal during 1892, though it was large in bulk, was not so profitable as in 1891. The prices at this time last year were: Main, 8s.; ell, 9s.; splint, 9s. 6d.; and steam, 10s. 9d. per ton. Last week they were: Main, 6s. 9d. to 7s.; ell, 7s. 9d.; splint, 7s. 9d.; and steam, 8s. 9d. to 9s. per ton. Very little business was done last week. The shipments were again large, amounting to 153,502 tons—an increase over the exports of the preceding six days of 18,850 tons, and over the corresponding week of last year of 40,008 tons. For the year, the total shipments were 7,611,846 tons—an increase upon the same period of 1891 of 980,420 tons.

The Water Supply of Pudsey and District.—A special meeting of the Pudsey Local Board has been held to consider some new developments in the negotiations that have been going on for a long period in reference to the supply of water to the three districts of Pudsey, Calverley, and Farsley. Mr. Walker, the Chairman of the Joint Water Committee, moved that the amended draft agreement between the Board and the Bradford Corporation for the supply of water in bulk for a term of twenty years be approved; and he also gave particulars of a recent interview a deputation had had with the Bradford Corporation Water Committee, who submitted three courses to them—(1) That the agreement should be signed for twenty years; (2) that the Water Committee of the Corporation undertook to supply the three Boards with water, street by street, at the same price and on the same terms as it is supplied to the people of Bradford; (3) that, failing the two former, a forty years' lease would be granted to the existing Calverley District Water Company. As the result of this interview, they felt justified in sending up a deputation to the Local Government Board to lay before them the three propositions, with a view to asking for their opinion thereon. Mr. Simpson, the Solicitor to the Board, stated that the Local Government Board would give their consent to the purchase of the plant and undertaking of the Calverley Water Company; but they pointed out that this would have to be done before either the Local Boards or the Corporation could take over the water supply of the district. The opinion was expressed by Mr. Simpson that, when the Boards had obtained possession of the works, and adopted the resolution submitted to them, the Bradford Corporation in course of time, and when sanction had been given to the borrowing of the necessary amount of money required to purchase the mains, &c., would be prepared to cancel the present agreement, and to carry out their second proposal—viz., to supply water direct to the district, street by street, at the same price and on the same terms as it was supplied to the people of Bradford. The matter was fully discussed; and the resolution was afterwards adopted. The amended draft agreement has also been approved by the Farsley Local Board. Since the above meeting, the Local Boards of Pudsey, Calverley, and Farsley have received the formal consent of the Local Government Board to the purchase of the undertaking of the Calverley and District Water Company. By this means the last obstacle to the settlement of this question was removed; and the 20 years' agreement for taking water in bulk from the Bradford Corporation will be proceeded with.

Staines and Egham Gas Company.—The annual meeting of this Company was held on the 22nd ult., to receive the Directors' report and financial statement for the year ending Sept. 30 last. The profits for the year were not so large as those of 1889-90, although they exceeded those of 1890-1 by £489; but, comparing the figures for 1889-90 with the past year, it is seen that there was an increase in the cost of coal alone of £920. There was also a decrease in the amount realized for the residual products. The total receipts amounted to £11,145; and the expenditure to £9654. The Directors recommended the payment of a dividend of 10 per cent., less income-tax. The Chairman (Mr. J. Harris) having moved the adoption of the report, a short discussion ensued, during which a shareholder moved that a dividend of 12½ per cent. should be paid. The report was adopted, and the larger dividend declared.

Subsidence of a Roadway.—An extraordinary subsidence of a public roadway took place at Hampstead on Monday last week. For some days the people in the neighbourhood of White Bear Green, New End, had perceived a strong smell of gas in their houses. A communication was made to the Gas Company's officials, who immediately took steps to find out the cause. An opening was made in the roadway, to ascertain if there was a leakage; and it was seen that there was a considerable accumulation of gas under the top crust of the roadway and for some distance down. As the gas escaped from the opening, a large portion of the roadway not far off gradually subsided. For a length of about 9 yards and a width of about 5 yards the road gave way to a depth of several feet; exposing gas and water mains, and showing that in places the roadway was hollow under the surface. The hole was promptly filled up, and other necessary steps were taken for the public safety.

Gas Consumption in Birmingham.—The mild and clear weather which was experienced during the week preceding Christmas, and which gave no indication of the wintry experiences which we have since had, is found to have exercised a very marked effect in connection with the consumption of gas from the works of the Birmingham Corporation. The week of the Gas Department is from Thursday to Thursday; and the Secretary (Mr. Edwin Smith) states that, in the week ending Dec. 22, the consumption was smaller than in the corresponding week of last year by 10,000,000 cubic feet. The total amount of gas burned was 134,284,000 cubic feet, as compared with 144,402,000 feet in the week ending Dec. 24 last year. We have to go back to 1889 for a week preceding Christmas in which the consumption was so low. These figures would be slightly affected by the inclusion or exclusion of Christmas Eve from the week. The corresponding week last year included Christmas Eve, when the shops were open late, besides which Christmas was preceded by several dark foggy days; and the demands upon the gas-making resources were so great that it was necessary to send out notices asking consumers to economize lest the supply should not hold out.

Bradford and the Water Supply of Drighlington.—At a meeting of the Drighlington Local Board last Wednesday week, a deputation who had waited upon the Bradford Corporation Water Committee, reported the result of their interview. It appears in the early part of 1890 the Local Authorities of Drighlington and Gildersome made overtures to Bradford to be supplied with water; and, by agreement between the two townships, Drighlington laid down a trunk line of water-mains from the Bradford boundary at Dudley Hill to the boundary with Gildersome, large enough to supply both townships; Gildersome contracting to pay 6 per cent. on the outlay. The rate of interest was gradually reduced by subsequent agreement, till it reached 3½ per cent.; and a year ago, upon Drighlington refusing to still further lower it, Gildersome seceded, and made arrangements to be supplied with water from Morley. Later the Drighlington Board made overtures to the Bradford Corporation, with the result that the latter body offered a price for the trunk line, which was declined. Bradford has since agrsed to buy the whole of the water-mains if a satisfactory price can be agreed upon. Considerable discussion took place at the meeting referred to above; and it was ultimately decided to offer the plant to the Bradford Corporation for £4000.

Charge of Obtaining Subscriptions for a Gas and Water League.—At the Westminster Police court, last Friday, Mr. G. L. Cobden, an elderly man residing in Newton Road, Bayswater, surrendered to his recognizances, before Mr. De Rutzen, to further answer a charge of obtaining the sum of 1s. by false pretences from Mr. Sidney Klosz, chemist, of King's Road, Chelsea. Mr. Baker appeared for the accused, who had solicited signatures to a petition to the House of Commons in favour of the objects of an association known as the Gas and Water League. After Mr. Klosz had signed the petition, the defendant asked for a subscription, and obtained 1s. on presentation of a book which contained the names of well-known traders who were represented as subscribers and supporters of the movement. Inspector Barton, who produced the documents found on the defendant, suggested that names had been used without authority, and that the defendant was unknown at an address in Coleman Street, City, which figured in the petition. Witness's inquiries went to show that the Gas and Water League had advanced no further than the collecting process, though this had been going on for ten years, and that no parliamentary action had been taken. Mr. Baker said the defendant was a gentleman of independent means, who was doing a public work. Mr. Cobden had already been instrumental in getting the price of gas reduced; and the object of the League was to get the cost of water charged against consumers by meter instead of on the assessment of the premises. Mr. De Rutzen said that if Mr. Baker could show how all the money which defendant had collected had been expended, he would be very glad to hear the explanation. Mr. Baker said the money was required to meet the expenses of promoting a Bill in Parliament. It was a *bonâ fide* movement, and Sir Charles Dilke's Secretary was in court ready to testify that the right honourable gentleman had been asked to present the defendaut's petition in the next session. Mr. De Rutzen said this might be true, but it was evident the defendant had been going about time after time, and from place to place, collecting money. There must be a further remand for the matter to be threshed out; and if the police had to proceed further, they ought to have legal assistance. The Magistrate accepted defendant's own recognizances to appear again.

Electric Lighting for Cardiff.—At a meeting of the Cardiff Corporation Gas and Electric Lighting Committee last Tuesday week, Mr. W. H. Massey was appointed to act as Consulting Engineer during the carrying out of the electric lighting installation for the borough. That gentleman's estimate for the works is £32,500; but this provides for buildings twice as large, and a chimney five times as large, as are required for the area at present proposed to be lighted.

The New Welsh Water Scheme and the Charges for Water in Birmingham.—A report of the Water Committee dealing with the revision of the water charges in view of the new Welsh scheme has been issued to the members of the Birmingham City Council. The Committee state that they have now carefully considered the revision of the water-rents, which is a necessary step towards the provision of the special water fund to be established, under section 70 of the Corporation Water Act of 1892, to meet the cost of the proposed works. They submit two tables, the first of which shows the alterations suggested in the water-rentals of all kinds, whether from domestic or trade supplies, or other miscellaneous sources; and the second shows in detail the scales proposed for domestic supplies of houses the rateable value of which is less than £50. In the report presented to the Council on Oct. 13, 1891, it was stated that it would be necessary, according to Mr. Mansergh's calculation of outlay, to reimpose charges amounting to £28,000 a year; and this was the sum appearing in the revised table he submitted to the Committee of the House of Lords. The calculation was, however, in each case based on the supposition that the new charges would come into force for the current financial year. An increase of £28,000 in 1892 corresponds with an increase of £28,840 in 1893, in consequence of the additional services laid on; and it is, therefore, the latter sum which the Committee have had to provide for in the revision. The new scales, if approved by the Council, are expected to cover this amount, with a margin of a few hundred pounds. The reductions in the scale of charges made in the years 1881, 1883, and 1884 would amount on the present rental to £35,843; and the additions to be now made fall short, by upwards of £6000 of the sum previously remitted. The Committee propose, with the sanction of the Council, to adopt the altered rates on April 1, being the beginning of the next financial year.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. ii.)

Issue.	Share	When ex-Dividend.	Dividend or Interest Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	14 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	11—12	..	6 5 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	30 Nov.	8	Bahia, Limited	20	11—12	..	13 6 8
200,000	5	16 Nov.	7½	Bombay, Limited	5	5¼—6¼	..	6 0 0
40,000	5	,,	7½	Do. New	4	4—4½	..	6 13 4
580,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	212—217	..	5 12 10
150,000	,,	,,	9½	Do. New	100	163—168	..	5 10 1
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol.	100	103—106	..	4 14 4
320,000	20	29 Sept	11½	British.	20	41—43	..	5 6 11
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14½—15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	7½—8½	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	99—102	..	5 17 8
150,000	20	12 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	14 Oct.	13	Commercial, Old Stock	100	232—237	..	5 9 8
165,000	,,	,,	10	Do. New do.	100	180—185	..	5 8 1
160,762	,,	15 Dec.	4½	Do. 4½ p. c. Deb. do.	100	120—125	..	3 12 10
800,000	Stck.	15 Dec	13	Continental Union, Limited.	100	220—225	..	5 15 6
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	187—192	..	5 4 8
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185—190	..	5 5 8
486,090	10	28 July	10	European, Limited	10	19½—20½	..	4 17 7
354,060	10	,,	10	Do. Partly paid	7½	14—15	..	5 0 8
5,470,820	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	221—225	+2	5 6 8
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95—98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	260—265	..	3 15 6
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 7
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	166—171	..	4 7 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	161—166	..	4 4 3
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	257—262	..	3 16 3
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	152—156	+½	3 16 11
1,061,150	,,	15 Dec.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122—125	..	3 12 10
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	16 Nov.	12	Imperial Continental	100	219—223	—2½	5 7 7
75,000	5	30 Nov.	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	107—109	..	4 11 9
541,920	20	16 Nov.	5	Monte Video, Limited.	20	14½—15½	..	6 9 0
150,000	5	30 Nov.	10	Oriental, Limited	5	8—8½	..	5 17 8
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4½	..	7 7 4
166,870	10	—	2	Pará Limited.	10	2—2½	..	—
480,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 Dec.	6	and Do.	100	100-105	..	5 14 3
150,000	10	—	10	San Paulo, Limited	10	8½—9½	..	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	288—293	+1	5 5 9
1,350,000	,,	,,	12	Do. B do.	100	235—239	+1	5 0 5
230,000	,,	,,	13	Do. C do.	100	245—250	+2	5 4 0
725,000	,,	14 July	5	Do. 5 p. c. Deb. Stk.	100	140—144	..	3 9 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
744,897	Stck.	30 Dec.	10	Chelsea, Ordinary	100	245-250*	+2	4 0 0
1,720,252	Stck.	14 Oct.	8	East London, Ordinary	100	202—206	..	3 17 8
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	141—144*	+½	3 2 6
700,000	50	15 Dec.	8½	Grand Junction	50	104—108	..	3 18 8
708,000	Stck.	12 Aug.	11	Kent	100	275—280	..	3 18 7
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	217—222*	+1½	4 5 7
406,200	100	,,	7½	Do. 7½ p. c. max.	100	189—193*	+½	3 17 8
285,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	123—128	..	3 2 6
500,000	100	12 Aug.	12½	New River, New Shares	100	325—330	..	3 13 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 8
902,300	Stck.	15 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	148—153	..	4 4 11
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	135—140	..	4 12 10
1,155,066	Stck.	15 Dec.	10	West Middlesex.	100	237—242	..	4 2 1

*Ex Div.

Issue of New Capital by the Woking Water Company.—The shareholders of the Woking Water Company have empowered the Directors to raise £10,000, by the issue of new ordinary shares of £10 each; being part of the additional capital of £50,000 authorized by the Company's Act of 1885.

Increase in the Price of Gas at Stockport.—The Gas Committee of the Stockport Corporation have resolved upon an increase in the price of gas. It appears that a recent reduction in the hours of labour of the employees from twelve to eight per day has occasioned an additional expenditure of £1700 per annum. A more serious matter is the depreciation in the value of residuals, which makes a difference of about £4000 a year in the receipts of the Committee. Under these circumstances, the Town Council will be asked at their next meeting to sanction an increase in the price of gas from 2s. 6d. to 2s. 8d. per 1000 cubic feet.

Fatality at the Halifax Water-Works.—An inquest was held a few days ago at Halifax on the body of James Hoskin, who died from injuries received while following his employment at the Green Withins reservoir of the Halifax Corporation, on the 20th ult. It appears that after some blasting operations, Henry Todd, a crane driver stepped on to the carriage of a steam-crane, and put his arm between the spur-wheel and the brake-lever to screw the spindle gland down to prevent the steam escaping. In doing so, he must have unhitched the catch of the lever, which caused an iron skip to lower. In its descent it struck a stretcher across the trench, and unhooked the skip from the crane chain; thus causing it to fall into the bottom of the trench, where the deceased was working. When the catch unhitched, the lever sprang up and caught Todd's arm, and held it fast for a minute or two. If this had not been the case, he could have put his foot on the brake and stopped the skip. A verdict of "Accidental death" was returned; no blame being attached to anyone.

Winding Up of the Chagford Gas Company.—The shareholders of the Chagford Gas Company have agreed to a suggestion of the Directors that the concern should be wound up, and the works and other property disposed of. For some time past, through a paucity of consumers, the Company have not paid a dividend; and the introduction of the electric light into the place about two years since has, it appears, somewhat affected the interests of the concern.

The Dispute between the Accrington Corporation and the Gas Company.—Another stage has been reached in the dispute between the Corporation and the Gas Company at Accrington. As the Corporation refuse to pay the Company the increased price for the gas consumed during the past quarter, on the ground that insufficient notice of the advance was given, the Company have now tendered the amount due by them for rates, less the amount of the gas bill. The Corporation decline to accept this sum; and it now remains to be seen whether they will sue the Company for the rates, or the Company will proceed against them for the amount of the gas bill.

Wages Dispute at the Bolton Gas-Works.—Last Friday, a dispute took place between the workmen engaged at the Bolton Gas-Works and the management, which at one time threatened to have a serious termination. It was pay-day, and the men who had worked on Christmas Day were paid double rates; but they were dissatisfied—contending that, as Christmas Day had fallen on Sunday this year, they were entitled to time and time-and-a-half—2½ days' pay (12s. 6d.) for Christmas Day—the allowance for an ordinary Sunday being time-and-a-half. It was explained that the rate of pay given was in accordance with the decision of the Gas Committee; and, after a long deliberation, the men agreed to resume work pending the decision of that body upon the subject. Some of the men argued for a total cessation of work until the extra pay was forthcoming; but wiser counsels prevailed.

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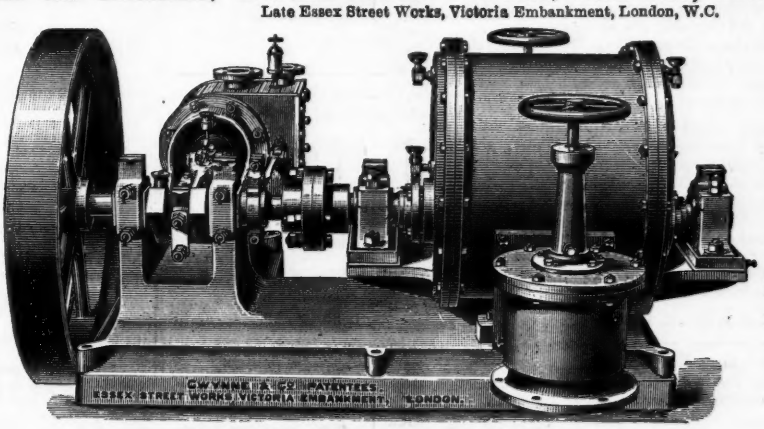

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Dec. 17, 1892.

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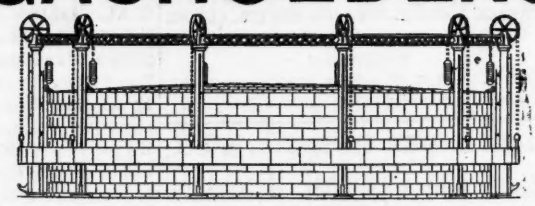

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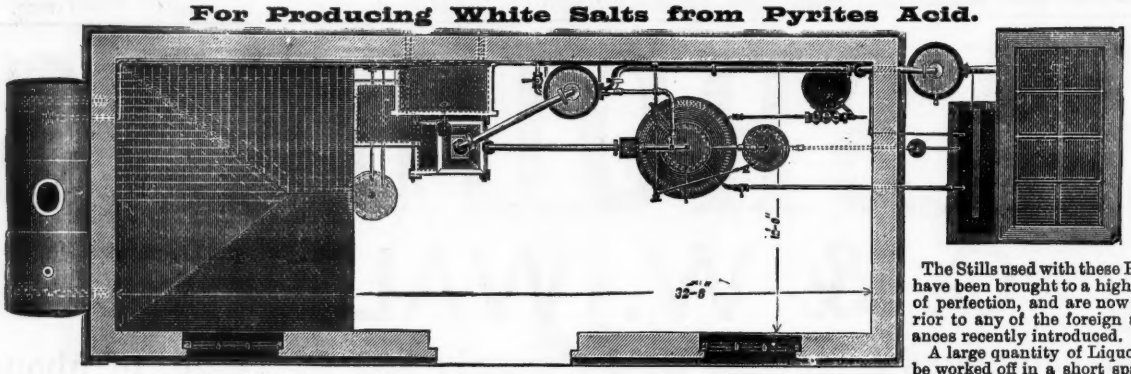

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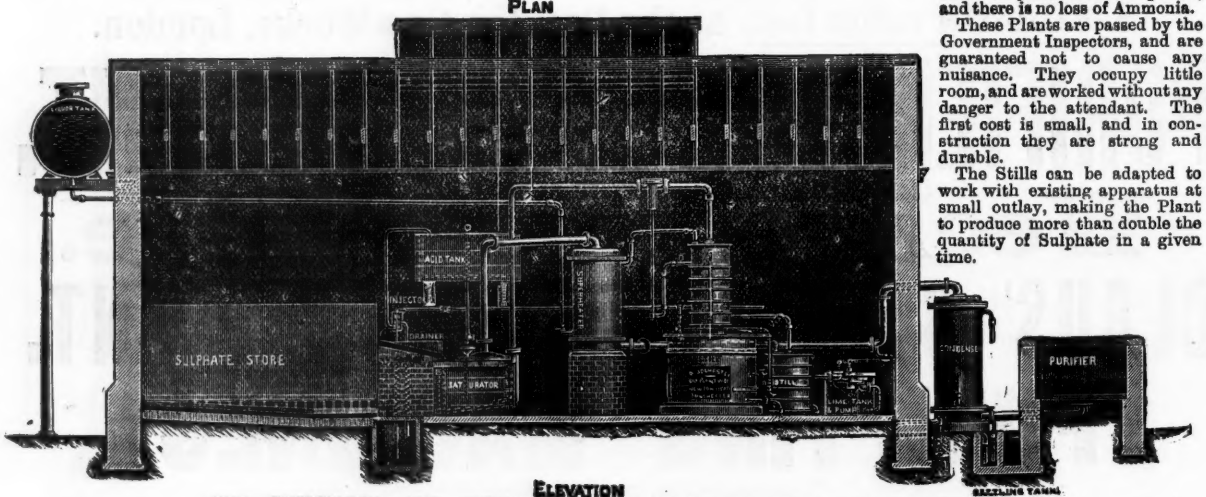

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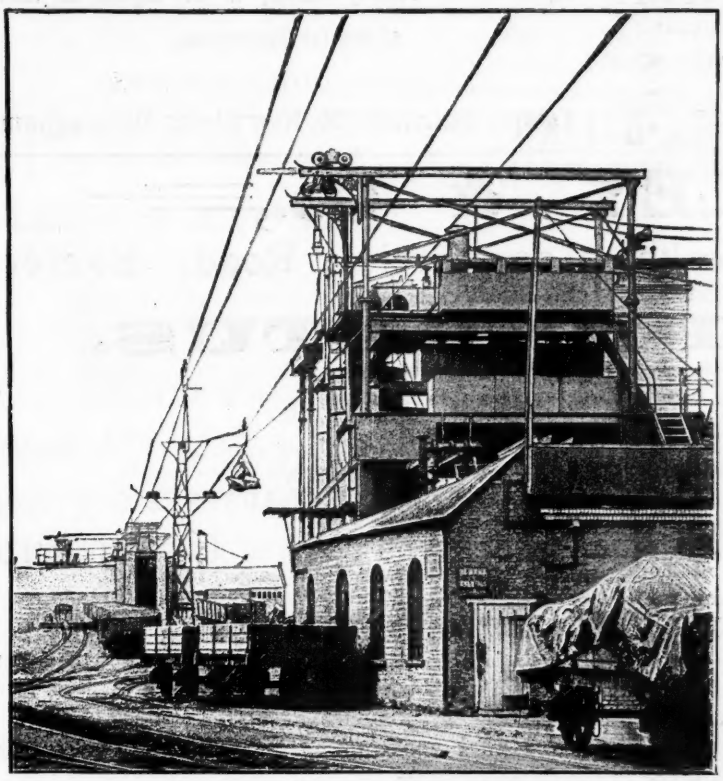

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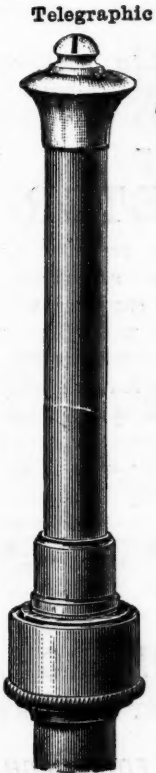

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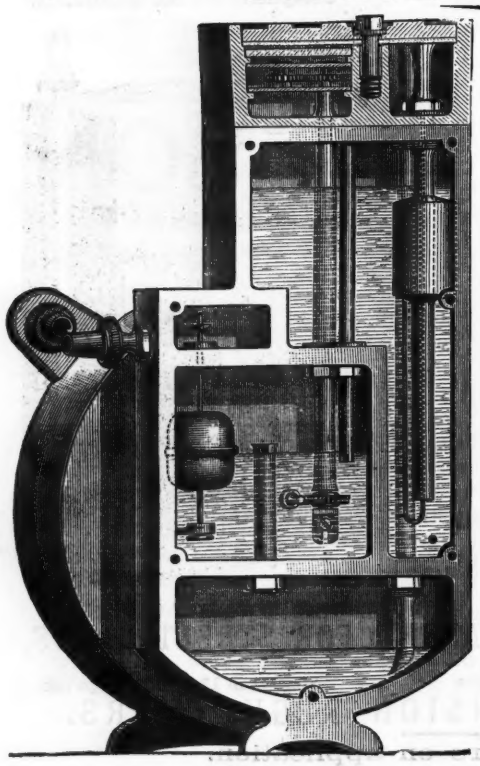

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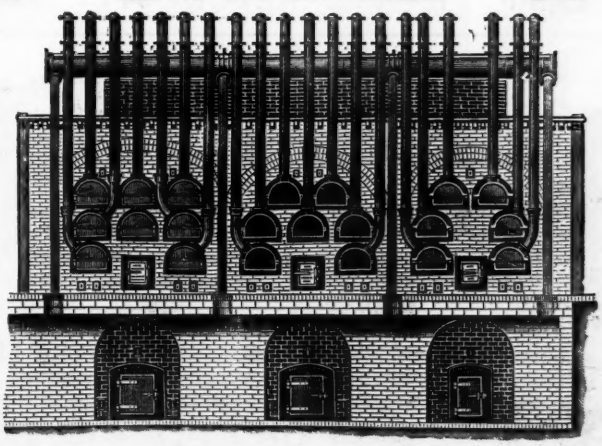

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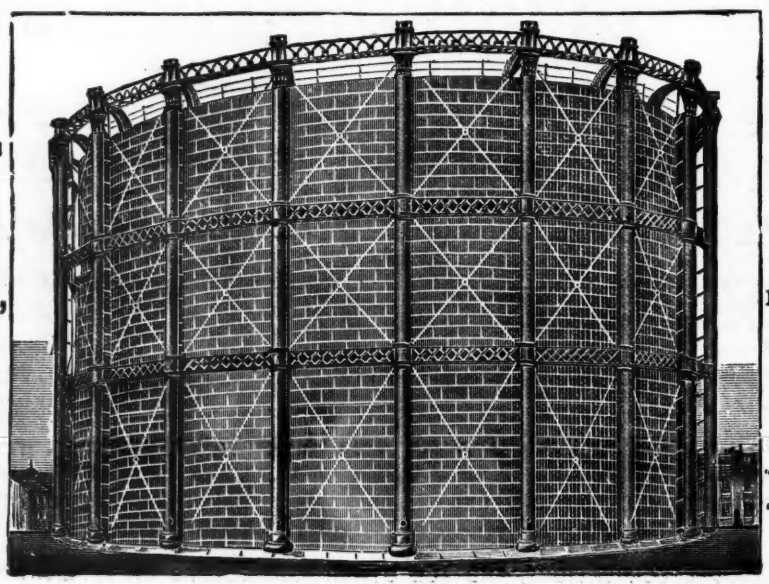

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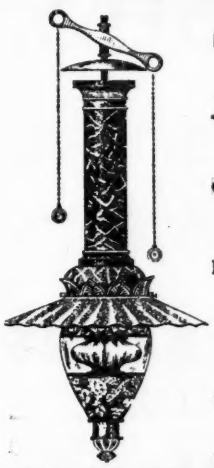
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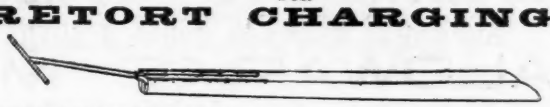
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Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

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